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WISCONSIN ACADEMY

OF

SCIENCES, ARTS, AND LETTERS

SYSTEMATIC LISTS

ILLUSTRATIVE OF THE

Flora, Fauna, Palæontology,

AND

Archæology

OF THE

NORTH OF IRELAND.

BY MEMBERS OF

The Belfast Naturalists' Field Club.

VOL. I.

Belfast:
PRINTED FOR THE CLUB.

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PREFACE.

IN the Annual Report of the Club for the year ending 31st March, 1870, it was stated that "The Committee considered it advisable that the Club should prepare complete lists of the Fauna, Flora, Geology, and Archæology of Ulster, by publishing an annual contribution to such a work in addition to the ordinary Report." The purpose thus indicated has been kept steadily in view, the work being inaugurated by Professor Ralph Tate, F.G.S., in a paper issued in 1870, as an appendix to the Report of that year. Owing to the long-continued researches, and the special knowledge required on the part of the authors of the lists, it has not been found possible to publish an appendix every year, nevertheless the series at the present time numbers twenty-one separate papers, extending over 342 pages, illustrated by 27 plates. Thus, though there have been occasional breaks in the regularity of the issue, it has so happened that sometimes several contributions were received and printed in one year, and accordingly the promise has been more than fulfilled.

The papers that form the present volume have all appeared as appendices to the Club's Proceedings, which are printed and distributed annually, but, with a view to their publication in a collected form, the appendices have been separately paged. In these Memoirs, there are given the results of long-continued and laborious research by members of the Club, in the subjects as to

which they are most competent. These results are already in the possession of the earlier members; but it is considered that the time has now arrived when they should be given to those more recently elected, and to the general public.

In the treatment of the various subjects, conciseness has been the aim throughout; but the several compilers have arranged their matter in such manner as was considered by each the most suitable for the elucidation of his subject with brevity. Whatever opinions may be formed as to the style or method of these papers, it is certain that they furnish the fullest, most authentic, and most recent information respecting their different departments.

In issuing this, the first volume prepared in accordance with the plan of 1870, it is earnestly hoped that it may not only prove useful to such as are commencing to investigate, but that it may stimulate to further exertion those who have been long engaged in the work. Several branches of local Natural History remain still untouched, and much of our Archæology requires further elucidation; and for these purposes additional workers are wanted, and will doubtless be forthcoming. Many volumes such as this are required before the plan can be said to be complete, and it may reasonably be hoped that they will follow in due time. With a more ripened experience on the part of the Club, and a succession of compilers equally painstaking, but having still more extended knowledge, it may be anticipated that the present will be surpassed by future volumes of the series.

WILLIAM SWANSTON, F.G.S.,
F. W. LOCKWOOD, } *Hon. Secs.*

BELFAST, *November, 1886.*

TABLE OF CONTENTS.

		PAGE
APPENDIX	I.—A list of the Irish Liassic Fossils, with notes on the new and critical species, by Ralph Tate, Assoc. Lin. Soc., F.G.S., &c. Plate I.	1
,,	II.—A list of the Irish Liassic Foraminifera, by Joseph Wright, F.G.S., F.R.G.S.I.	25
,,	,, —A list of the Fossils of the Estuarine Clays of the Counties of Down and Antrim, by Samuel Alex. Stewart, F.B.S.Edin.	27
,,	III.—A list of the Mosses of the North-east of Ireland, by Samuel Alex. Stewart, F.B.S.Edin.	41
,,	,, —A list of the Cretaceous Microzoa of the North-east of Ireland, by Joseph Wright, F.G.S., F.R.G.S.I. Plates II. & III.	73
,,	IV.—Recent Foraminifera of Down and Antrim, by Joseph Wright, F.G.S., F.R.G.S.I. Plate IV. ...	101
,,	,, —Correlation of the Silurian Rocks of County Down, by William Swanston, F.G.S., and Charles Lapworth, F.G.S. Plates V., VI., VII.	107
,,	V.—A list of the Post-Tertiary Foraminifera of the North-east of Ireland, by Joseph Wright, F.G.S. ...	149
,,	,, —A list of the Mollusca of the Boulder Clay of the North-east of Ireland, by Samuel Alex. Stewart, F.B.S.Edin.	165
,,	VI.—A list of Recent Foraminifera from South Donegal, by Joseph Wright, F.G.S. Plate VIII. (in part) ...	178
,,	,, —Sponge Remains from the Carboniferous Strata of Ben Bulben, near Sligo, by Joseph Wright, F.G.S.	189

PAGE

APPENDIX VI.—Fossil Sponge Spicules from the Carboniferous Strata of Ben Bulben, near Sligo, by H. J. Carter, F.R.S., &c. Plate VIII. (in part) 190

,, VII.—Supplement to a list of Mosses of the North-east of Ireland, by Samuel Alex. Stewart, F.B.S.Edin. 196

,, VIII.—Notes on Irish Coleoptera, by A. H. Haliday, F.L S. 211

,, ,, —The Cromlechs of Antrim and Down, by William Gray, M.R.I.A. Plates IX. to XX. 225

,, ,, —Notes on the Pre-Historic Monuments at Carrowmore, near Sligo—the Battlefield of Northern Moytura, by Charles Elcock. Plates XXI. to XXIV. ... 249

,, IX.—Recent Ostracoda of Belfast Lough, by Samuel M. Malcomson, M.D. Plate XXV. 259

,, ,, —The Fungi of the North-east of Ireland, by Henry William Lett, M.A., T.C.D. 265

,, ,, —Foraminifera of "Protector" Cruise, and from Rockport, Belfast Lough, by Joseph Wright, F.G.S. Plate XXVI. 317

,, ,, —A list of the Cretaceous Microzoa of Keady Hill, County Derry, by Joseph Wright, F.G.S. Plate XXVII. 327

,, ,, —A list of Irish Coleoptera, by Robert Patterson, F.R.S. 335

LIST OF PLATES.

PLATE I.—Irish Liassic Fossils—Tate.

,, II. } Cretaceous Microzoa of North-east of Ireland—Wright.
,, III. }

,, IV.—Recent Foraminifera of Down and Antrim—Wright.

,, V. }
,, VI. } Graptolites of County Down—Swanston & Lapworth.
,, VII. }

,, VIII. { Recent Foraminifera of South Donegal—Wright.
{ Fossil Sponge Spicules from Ben Bulben—Carter.

,, IX.—Cromlechs, &c., of Antrim, Carnanmore, & Doonan.

,, X.— ,, ,, Roughfort and Mount Druid.

,, XI — ,, ,, Glegnagh and Cloughnaboghill.

,, XII.— ,, ,, Cloughanuncher & Ballyvennaght

,, XIII.— ,, ,, Cloughs and Ticloy.

,, XIV.— ,, ,, Broadstone and Finvoy.

,, XV.— ,, ,, Cloughogan and Druid's Altar.

,, XVI.— ,, of Down, Giant's Ring and Kempe Stone

,, XVII.— ,, ,, Mountstewart and Loughmoney

,, XVIII.— ,, ,, Loughanisland & Slidderyford.

,, XIX.— ,, ,, Cloughmore and Legananny.

,, XX.— ,, ,, Kilkeel and Causeway Water.

,, XXI.—Cromlechs of Carrowmore, Co. Sligo, Dr. Petrie's, No. 13 and No. 7—Elcock.

,, XXII.—Cromlechs of Carrowmore, Co. Sligo, Dr. Petrie's, No. 4 and No. —Elcock.

,, XXIII.—Cromlechs of Carrowmore, Co. Sligo, Dr. Petrie's, No. 14 and No. —Elcock.

,, XXIV.—Cromlechs of Carrowmore, Co. Sligo, Dr. Petrie's, No. 37. —Elcock.

,, XXV.—Recent Ostracoda of Belfast Lough—Malcomson.

,, XXVI.—Foraminifera of "Protector" Cruise, & Rockport—Wright.

,, XXVII.—Cretaceous Foraminifera of Keady Hill—Wright.

ERRATA.

Page 26—For *Dr. H. P. Brady, F.L.S.*, read *Henry B. Brady, F.L.S.*
Page 41, line 14—For *succeeded*, read *preceded.*
Page 46—For *H. hamulosum*, read *H. molluscum var. gracile, Bontay.*
Page 52—For *F. incurvis*, read *F. pusillus, Wilson.*
Page 58—For *Avtrichum*, read *Atrichum.*
Page 61—For *G. ovata*, read *G. Doniana, Smith.*
Page 69—For *D. squarosum*, read *D. squarrosum.*
Page 104—For *Lagena hispida, Reuss*, read *Lagena aspera, Reuss.*
Table following page 105—For *Lagena hispida, Reuss*, read *Lagena aspera, Reuss.*
Explanation Plate IV.—For *Lagena hispida, Reuss*, read *Lagena aspera, Reuss.*
Page 150—For *pygmea*, read *pygmæa.*
Page 153—For *polycistinæ*, read *polycystina.*
Page 157—For *canariensis*, read *canariense.*
Page 157—For *pygmea*, read *pygmæa.*
Page 160—For *vivipera*, read *vivipara.*
Page 160—For *Nonionina asterizans, F. & M.*, read *Nonionina stelligera, d'Orb.*
Page 161—For *canariensis*, read *canariense.*
Page 162—For *marginata, var. trigono-marginata, W. & J.*, read *marginata, var. trigono-marginata, P. & J.*
Page 170—For *List of the Mollusca of the North-east of Ireland*, read *List of the Mollusca of the Boulder Clay of the North-east of Ireland.*
Page 175—For *Turpura*, read *Purpura.*
Page 183—For *Psammatodendrom*, read *Psammatodendron.*
Page 187—For *Mediterraneensis*, read *Mediterranensis.*
Page 207—For *Crown Mountain*, read *Crown Mount.*

APPENDIX I.

A LIST

OF THE

IRISH LIASSIC FOSSILS,

WITH NOTES ON THE NEW AND CRITICAL SPECIES,

BY RALPH TATE,

ASSOC. LIN. SOC., F.G.S., &c.

PUBLISHED BY

BELFAST NATURALISTS' FIELD CLUB.

SEPTEMBER, 1870.

A LIST OF

THE IRISH LIASSIC FOSSILS,

WITH NOTES ON THE NEW AND CRITICAL SPECIES,

BY RALPH TATE, ASSOC. LIN. SOC., F.G.S., &c.

THE only Author, excepting myself, who has enumerated the fossils of the Lias of the Province of Ulster—that division of Ireland in which, only, that formation is developed—is the late General Portlock.

The specimens on which he based the list in the "Survey of Londonderry," pp. 747—769 (1843), now form part of the Collection of the Museum of Practical Geology, London, and that of the Museum of the Irish Geological Survey, Dublin; these I have carefully examined, and the results arrived at are embodied in List I, in the left hand column of which are arranged the specific names quoted by Portlock, and in the right hand those that I have adopted.

The sign ! is prefixed to those species, original specimens of which I have examined. Those included in brackets are for the present expunged from the list of Irish Liassic fossils, because from their known distribution, it is extremely probable that these determinations are erroneous; at any rate their identification requires further confirmation. Some species, examples of which are not now in the Portlockian Collection, have received new names. These are adopted, because there is no doubt that they are the species to which Portlock's descriptions are applicable, and which, moreover, have occurred to me in the Liassic strata of the North of Ireland.

The first column of List I. contains 107 specific names, but by the elimination of synonyms, and the rejection of a few doubtful determinations, the

number is reduced to 71. This has been increased during the last few years to 189, all of which species are catalogued in List II.

This list cannot be considered complete, inasmuch as additional species have been found time after time, on the occasion of revisiting those sections, which have yielded the greater number of the fossils, and which, consequently, from past experience, will continue to reward a search by an industrious collector.

The principal localities in County Antrim are Colin Glen and Cave Hill, near Belfast; Whitehead, Island Magee, and Waterloo, near Larne; Glenarm; between Garron Point and Red Bay; Ballintoy. In County Londonderry, Magilligan, Aghanloo, &c., whence Portlock obtained the majority of the species of his catalogue.

List No. II. shows the range of each species in the several members of the Lias, as described by me in the Quarterly Journal Geological Society, Vol. xx., p. 103 (1863); Vol. xxiii., p. 297 (1867); Vol. xxvi. (1870).

The Liassic system is represented in the North of Ireland by the formations termed Rhætic, Lower Lias, and Middle Lias.

The Rhætic series is as fully developed in the immediate neighbourhood of Belfast as in any portion of Great Britain; it is there capable of division into the "Avicula contorta-shales," and the White Lias. Not more than 29 species have been satisfactorily identified from this formation; 24 of these occur in the lower zone, and 13 in the upper, whilst 5 of them pass up into the Lower Lias.

The Lower Lias, which I have divided into four zones or palæontological horizons, has yielded 151 species, 2 of which are common to the Middle Lias. The "Planorbis Zone" has afforded 24 species; two only, *Gervillia acuminata, and Mytilus subtilis*, are confined to it, whilst the majority do not extend upwards beyond the overlying zone. The "Angulatus-beds," relatively rich in Gasteropods and Corals, have yielded 120 species, 26 of which pass to the upper zones. The "Bucklandi-beds" have not been so thoroughly searched as the lower zones, and I can only enumerate 21 species from them, but 5 of these appear to be limited to this horizon.

The Ballintoy, or "Belemnites acutus shales," have yielded 44 species. They are comparatively rich in peculiar Cephalopods, and 19 species in all are confined to this zone.

The Middle Lias at Ballintoy contains sixteen species, two only of which occur in the inferior beds.

In the following table are indicated the number of species known and inferred that pass from lower to higher zones, and the total number of species in each member of the Lias, and the per centage number of restricted species in each member.

	Avicula Shales	White Lias	Planorbis Zone	Angulatus Zone	Bucklandi Limestone	Belemnite Shales	Ballintoy Marls.	Total species known and inferred.	Per centage of restricted Species.
AVICULA SHALES ..	24	18	4	3	..	..	..	29	83
WHITE LIAS ..	..	13	5	4	..	..	..		
PLANORBIS ZONE ..	..	..	24	22	8	7	1	122	75
ANGULATUS „ ..	..	..	..	120	26	17	1		
BUCKLANDI „ ..	..	..	..	..	33	22	1	33	18
BELEMNITE SHALES	..	..	..	..	..	44	2	44	45
BALLINTOY MARLS	..	..	..	..	..	..	16	16	87·5

The specific names in List No. 2 supersede those which have previously been employed by me. The alterations have been necssitated in some cases on account of erroneous determinations, but, in the majority, because of the preference given to older names and synonymous denominations.

CATALOGUE I.

Amended List of Species cited by Portlock, from the Irish Lias.

CLASS PICES.

Species of Gen. Portlock's List.	Species adopted.
! Acrodus minimus, *Ag.*	Acrodus minimus, *Ag.*
! sp. *Portlock* t. xiv., fol. 17	Acrodus Tatei, *Moore, MS.*
! Gyrolepis Alberti, *Ag.*	Gyrolepis Alberti, *Ag.*
! Gyrolepis tenuistriatus, *Ag.*	Gyrolepis tenuistriatus, *Ag.*
! Saurichthys apicalis, *Ag.*	Saurichthys apicalis, *Ag.*

CLASS CEPHALOPODA.

! Ammonites armatus, *Sow.* ! Ammonites hastatus, *Y. & B.*	Ammonites armatus, *Sow.*
! Ammonites Bucklandi, *Sow.*	Ammonites Bucklandi, *Sow.*
! Ammonites multicostatus, *Sow.* (pars)	Ammonites Sauzeanus, *D'Orb.*
! Ammonites Conybeari, *Sow.* ! Ammonites striatulus, *Sow.*	Ammonites Conybeari, *Sow.*
! Ammonites elegans ? *Sow.* ! Ammonites læviusculus ? *Sow.* ! Ammonites subradiatus ? *Sow.*	Ammonites Buvgnieri, *D'Orb.*
! Ammonites intermedius, *Portl.* ! Ammonites Johnstoni, *Sow.*	Ammonites Johnstoni, *Sow.*
Ammonites Lamberti, *Sow.*	Ammonites angulatus, *Schloth.*
! Ammonites MacDonnelli, *Portl.*	Ammonites MacDonnelli, *Portl.*
! Ammonites planorbis, *Sow.* ! Ammonites Sampsoni, *Portl.*	Ammonites planorbis, *Sow.*
[Ammonites radians, *Rein.*]	?
! Ammonites multicostatus, *Sow.* (pars) ! Ammonites rotiformis, *Sow.*	Ammonites raricostatus, *Ziet.*
! Belemnites abbreviatus, *Mill.*	Belemnites acutus, *Mill.*

CLASS GASTEROPODA.

! Cerithium carbonarium ? *Goldf.*	Cerithium gratum, *Terq.*
! Dentalium tenue, *Portl.*	Dentalium Portlocki, *Tate.*
! Melania *cf* Bronni, *Röm.*	Turritella Dunkeri, *Terq.*
! Trochus anglicus, *Sow.*	Pleurotomaria similis, *Sow.*
[Trochus fasciatus ? *Sow.*]	? Pleurotomaria similis, *Sow.*
Turritella percincta, *Portl.*	Cerithium percinctum, *Portl.*
! Turritella tenuicostata, *Portl.*	Cerithium tenuicostatum, *Portl.*

CLASS CONCHIFERA.

! Arca pulchra ? *Sow.*	Cucullæa Hettangiensis, *Terq.*
! Astarte elegans, *Phil.* ! Astarte tetragona, *Portl.*	Astarte Gueuxii, *D'Orb.*
! Avicula contorta, *Portl.*	Avicula contorta, *Portl.*
! Avicula inæquivalvis, *Sow.*	Avicula novemcostæ, *Brown.*
! Avicula modiolaris, *Goldf.*	Avicula Pattersoni, *Tate.*
Avicula substriata, *Brown.*	! Avicula papyria, *Quenst.*
! Cardium striatulum, *Sow.*	Cardium Philippianum, *Dunk.*
! Cardium truncatum, *Sow.*	Cardium Rhæticum, *Merian.*
Corbis ? ovalis, *Phil.*	Lucina limbata ? *Terq. & P.*
! Cucullæa cucullata, *Goldf.*	Cucullæa Grangeri, *Tate.*
! Gryphæa cymbium, *Lamk.*	Ostrea cymbium, var. obliqua, *Lamk.*
! Gryphæa bullata ? *Sow.* Gryphæa dilatata, *Sow.* ! Gryphæa MacCullochi, *Sow* (pars)	Ostrea MacCullochi, *Sow.*
! Gryphæa incurva, *Sow.*	Ostrea arcuata, *Lamk.*
[Gryphæa MacCullochi, *Sow.* pars.]	[Gryphæa vesiculosa, *Sow.* Cretaceous.]
! Inoceramus cinctus ? *Goldf.*	Perna infraliassica, *Quenst.*
! Lysianassa rhombifera, *Goldf.*	Goniomya Sinemuriensis, *Oppel.*
! Lima alternans, *Röm.* Lima cardüformis, *Sow.* ! Lima pectinoides, *Sow.*	Lima pectinoides, *Sow.*
! Lima antiquata, *Sow.* ! Lima Hermanni, *Goldf.*	Lima succincta, *Schloth.*
! Lima rustica ? *Sow.*	Lima succincta, *var., jun.*
! Lima duplicata, *Sow.*	Lima Hettangiensis, *Terq.*
! Lima gigantea, *Sow.*	Lima gigantea, *Sow.*
! Lima proboscidea ? *Sow.*	Lima Terquemi, *Tate.*
! Lima punctata, *Sow.*	Lima punctata, *Sow.*
! Modiola bipartita ? *Sow.*	Mytilus rusticus, *Terq.*
Modiola compressa, *Goldf.*	?
! Modiola Hillana, *Sow.*	Mytilus Hillanus, *Sow.*
! id. pars. ! Modiola minima, *Sow.*	Mytilus minimus, *Sow.*
! Modiola alæformis, *Sow.*	Hippodium ponderosum, *Sow.*
! Modiola oblonga ? *Röm.*	Cypricardia compressa, *Terq.*
! Modiola, nov. spec.	Myoconcha psilonoti, *Quenst.*
! Modiola scalprum, *Sow.*	Mytilus Gueuxii, *D'Orb.*
! Nucula antiquata ? *Sow.* ! Nucula subglobosa ? *Röm.* ! Nucula variabilis ? *Sow*	Nucula navis, *Piette.*
! Nucula rostralis, *Goldf.*	Leda tenuistriata, *Piette.*
! Ostrea acuminata, *Sow.*	Ostrea irregularis, *Münst.*

! Ostrea, nov. spec.	Terquemia, arietes, *Quenst.*
! Pachyodon concinnus, *Sow.*	Cardinia concinna, *Sow.*
! Pachyodon crassiusculus, *Sow.* ! Pachyodon ovalis, *Stutch.*	Cardinia ovalis, *Stutch.*
! Pachyodon hybridus, *Sow.*	Cardinia Listeri, *Sow*, var. hybrida.
Pachyodon imbricatus, *Stutch.*	Cardinia Listeri, *Sow.*, var. imbricata.
! Panopæa ? elongata, *Röm.*	Anatina longissima, *Quenst.*
! Pecten sublævis ? *Phil.* ! Pecten subulatus ? *Münst.* ! Pecten textilis ? *Münst.*	Pecten dextilis, *Münst.*
! Pecton textorius ? *Schloth.* ! Pecten virguliferus ? *Phil.*	Pecten textorius, *Schloth.*
! Pecten Valoniensis, *Defr.*	Pecten Valoniensis, *Defr.*
! Pecten vitreus, *Röm.* ! Pecten calvus, *Goldf.* ! Pecten cingulatus, *Goldf.*	Pecten lunularis, *Röm.*
! Pinna cuneata, *Phil.* ! Pinna lanceolata, *Sow.* Pinna mitis ? *Phil.*	Pinna folium, *Y. & B.*
! Pinna Hertmanni, *Ziet.*	Pinna Harmanni, *Ziet.*
! Plicatula spinosa ? *Sow.*	Plicatula spinosa, *Sow.*
! Pholodomya longirostris, *Schloth.*	Pholodomya Fraasii, *Oppel.*
! Pholadomya ventricosa, *Goldf.*	Pholadomya glabra, *Ag.*
! Pholadomya myacites.	Pleuromya liasina, *Schübl*
! Pullastra ?	Pleuromya galathea, *Ag.*
Unio Listeri, *Sow.* ! Unio Nilssoni, *K. & D.*	Cardinia Listeri, *Sow.*
Unio peregrinus ? *Phil.* ! Unio trigonus, *Röm.*	Cardinia ovalis, *Stutch.*
! Unio subæqualis.	Unicardium cardioides, *Phil.*

CLASS BRACHIOPODA.

! Lingula Beanii, *Sow.*	Lingula Metensis, *Terq.*
Terebratula Mantelliana ? *Sow.*	Rhynchonella plicatissima, *Qnst.*
Terebratula obovata, *Sow.* ! Terebrata ornithocephala, *Sow.*	Waldhemia perforata, *Piette.*

CLASS ANNELIDA.

! [Serpula lævis, *Goldf.*	Serpula filiformis, *Sow.* Cretaceous].

CLASS ECHINODERMATA.

! Pentacrinites basaltiformis	? Extracrinus Briareus, *Mill.*

CATALOGUE II.

An Enumeration of the Liassic Species in the Irish Sub-divisions.

Explanations of Abbreviations.

v.c. very common; c. common; x. not common, or frequency unobserved; r. rare; v.r. very rare.

List of Species.	Distribution.							
	Rhætic.		Lower Lias.				Midle. Lias.	
	Avicula Shales.	White Lias.	A. planorbis Zone.	A. angulatus Zone.	A. Bucklandi Limestones.	Belemnite Shales.	Ballintoy Marls.	
Class Reptilia.								
Ichthyosaurus sp. (femur, teeth),....	r.	...	...	...	...	...	...	...
Ichthyosaurus (vertebræ),..	...	...	...	x.	...	...	...	...
Class Pisces.								
Acrodus minimus, *Ag.*	c.	...	...	...	...	...	...	...
Acrodus Tatei, *Moore*.....	c.	...	...	...	...	...	...	...
Gyrolepis Alberti, *Ag*.....	c.	...	...	...	...	...	...	...
Gyrolepis tenuistriatus, *Ag*.....	x.	...	...	...	...	...	...	...
Hybodus minor, *Ag*.....	x.	...	...	...	...	...	...	...
Hybodus raricostatus, *Ag*.....	r.	...	...	...	...	...	...	...
Hybodus reticulatus, *Ag*.....	...	..	...	...	...	...	r.	...
Saurichthys apicalis, *Ag*.	c.	...	...	...	...	...	...	...
Class Cephalopoda.								
Ammonites angulatus, *Schloth*....	...	...	r*	r.	...	...	...	*Portrush.
Ammonites armatus, *Sow*.....	...	...	...	...	...	c.	...	...
Ammonites Birchii, *Sow*...	...	...	...	...	...	r.	...	...
Ammonites Bucklandi, *Sow*.....	...	...	...	...	x.	x.	...	...
Ammonites Buvgneiri, *D'Orb*.....	...	...	...	...	...	x.	...	...
Ammonites Conybeari, *Sow*.....	...	...	...	...	...	c.	...	...
Ammonites Cluniacensis, *Dumort*..	...	...	...	...	...	x.	...	...
Ammonites Johnstoni, *Sow*.....	...	...	c.	v.c.	...	...	...	...
Ammonites MacDonnelli, *Portl*....	...	...	...	x.	...	...	...	...
Ammonites margaritatus, *Montf.* } ,, var. coronatus, *Quenst* }	...	...	...	...	...	...	r.	...
Ammonites Henleyi, *Sow*.....	...	...	...	...	...	...	x.	On authority Mr. Etheridge.
Ammonites planorbis, *Sow*	...	...	c.	x.	...	...	...	...
Ammonites Sauzeanus, *D'Orb*.....	...	...	...	x.	...	...	...	Gortmore, Col. Geo. Survey of Ireland.
Ammonites Turneri, *Sow*.....	...	...	...	x.	v.c.	...	...	...
Ammonites raricostatus, *Sow*.....	...	...	...	...	...	c.	...	...
Belemnites acutus, *Mill*.....	...	...	...	...	...	c.	...	...
Belemnites pencillatus, *Mill*.....	...	...	...	...	...	x.	...	On authority Prof. Phillips.
Belemnites præmaturus, *Tate*.....	...	...	...	r.	...	...	...	...
Belemnites umbilicatus, *Blainv*.....	...	...	...	...	...	...	c.	...
Nautilus striatus, *Sow*.....	...	...	...	x.	...	...	...	...
Class Gasteropoda.								
Actæonina avena, *Terq*.....	...	...	...	x.	...	...	...	...
Actæonina fragilis, *Dunk*..... ...	...	...	...	c.	...	...	...	...

TABLE—(CONTINUED.)

List of Species.	Distribution.							
	Rhætic.		Lower Lias.				Midle. Lias.	
	Avicula Shales.	White Lias.	A. planorbis Zone.	A. angulatus Zone.	A. Bucklandi Limestones.	Belemnite Shales.	Ballintoy Marls.	
Actæonina striata, *Piette*	...	...	...	x.	...	...	...	...
Cerithium gratum, *Terq.*	...	...	...	v.c.	...	...	...	...
Cerithium Semele, *D'Orb*	...	...	...	c.	x.	...	...	...
Cerithium pericinctum, *Portl.*	...	...	...	x.	...	...	...	On authority of Gen. Portlock.
Cerithium tenuicostatum, *Portl.*	...	...	...	c.	...	...	...	...
Chemnitzia punctata, nov. spec.	...	...	...	v.r.	...	...	...	...
Chemnitzia Berthaudi, *Dumortier*	...	...	...	v.c.	...	...	...	=Chemnitzia Tylori, *Tate*.
Cryptænia Brycei, *Tate*	...	...	...	r.	r.	...	...	...
Cryptænia expansa?, *Sow*	...	...	...	r.	...	...	...	...
Cryptænia rotelliformis, *Dunk.*	...	...	...	v.r.	...	...	...	...
Dentalium Portlocki, nov. spec.	...	...	...	x.	...	...	...	...
Littorina Chapuisi, *Terq & Piette*	...	...	...	v.r.	...	...	...	...
Littorina elegans, *Münst*	...	...	...	v.c.	...	...	...	...
Littorina liassica, *Martin*	...	...	...	r.	...	...	...	...
Littorina Strophium, *Dumort. sp.*	...	...	...	...	...	v.r.	...	...
Natica Oppelii, *Moore*	x.	...	...	...	...	...	...	...
Pleurotomaria similis, *Sow*	...	...	...	r.	r.	...	...	...
Pleurotomaria Tectaria, nov. spec.	...	...	...	r.	...	...	...	...
Phasianella Morencyana, *Trq. & Pte.*	...	...	...	c.	...	...	...	...
Pitonillus turbinatus, *Moore*	...	...	...	...	...	...	c.	...
Solarium Thomsoni, nov. spec.	...	...	...	r.	...	...	...	...
Tornatella inermis, *Terq.*	...	...	...	x.	...	...	...	Waterloo.
Tornatella Robinsoni, nov. spec.	...	...	...	...	...	v.r.	...	...
Trochus Waltoni, *Moore*	x.	...	...	...	...	...	...	...
Turitella crassilabrata, *Trq. & Pte.*	...	...	...	v.r.	...	...	...	...
Turitella Dunkeri, *Terq.*	...	...	...	r.	...	...	...	...
Turbo solarium, *Piette*	...	...	...	x.	...	...	...	=Turbo Burtoni, *Tate*, Garron Point.
Class CONCHIFERA.								
Anatina longissima, *Quenst*	...	...	x.	?	?	x.	...	...
Anatina myacina, nov. spec.	...	...	...	v.r.	...	...	...	...
Anatina præcursor, *Quenst*	...	x.	...	...	...	...	...	...
Anomia irregularis, *Terq*	x.	x.	...	...	...	...	...	...
Anomia pellucida, *Terq*	...	...	...	x.	?	x.	...	...
Anomia striatula, *Op.*	...	...	...	x.	...	...	...	...
Arca pulla, *Terq*	...	...	...	x.	...	...	...	...
Astarte Gueuxii, *D'Orb*	...	...	...	x.	?	x.?	...	=Astarte dentilabrum, *Etheridge*.
Astarte cingulata, *Terq*	...	...	...	x.	...	...	...	...
Astarte Oppelii, *Andler*	...	...	...	x.	...	...	...	=A Saulensis, *T. & P.*, Coll. Geo. Survey, Ireland.
Axinopsis Ewaldi, *Bornem*	x.	x.	...	...	...	...	...	=Axinus cloacinus, *Quenst*.
Axinopsis concentricus, *Moore*	...	x.	...	...	...	...	...	...
Avicula acuticosta, *Terq & Piette*	...	...	...	...	x.	...	...	...

TABLE—(CONTINUED.)

List of Species.	Distribution.							
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	Avicula Shales.	White Lias.	A. planorbis Zone.	A. angulatus Zone.	A. Bucklandi Limestones.	Belemnite Shales	Ballintoy Marls.	
Avicula contorta, *Portl.*	x.	...	...	...	...	...	...	...
Avicula Dunkeri, *Terq.*	...	...	x.	x.	...	...	...	...
Avicula fallax,	...	x.	...	...	...	...	...	=Monotis decussata.
Avicula novemcostæ, *Brown*	...	...	x*	?	x.	x.	c.	*Portrush *(Portlock.)*
Avicula Pattersoni, nov. spec.	...	...	...	x.	...	...	...	...
Avicula papyria, *Quenst.*	...	...	...	...	...	x.	...	...
Cardium Philippianum, *Dunk.*	...	...	...	x.	...	...	...	...
Cardium Rhæticum, *Merian*	x.	x.	...	...	...	...	...	...
Cardinia amygdala, *Terq*	...	...	...	x.	...	...	...	...
Cardinia Deshayesi, *Terq*	...	...	...	x.	...	...	...	...
Cardinia cyprina, *Ag.*	...	...	...	x.	...	...	...	...
Cardinia concinna, *Sow.*	...	...	...	x.	...	...	...	...
Cardinia Listeri, *Sow.*	...	...	...	r.	r.	...	...	...
Cardinia Listeri, var. hybrida	...	...	...	...	x.	v.r.	...	...
Cardinia ovalis, *Stutch*	...	...	x.	v.c.	...	...	...	...
Cardita Heberti, *Terq.*	...	...	...	c.	...	...	...	...
Cardita multicostata, *Phil.*	...	...	...	...	...	...	r.	...
Ceromya gibbosa, *Etheridge*	...	...	...	x.	...	...	...	=Isocardia Elea, *d'Orb.*
Cypricardia compressa, *Terq.*	...	...	...	x.	...	...	...	...
Cypricardia lævigata, *Terq.*	...	...	...	...	...	x.	...	...
Cypricardia tetragona, *Terq.*	...	...	...	x.	...	...	...	...
Cypricardia cucullata, *Goldf.*	...	...	...	...	...	...	r.	...
Cucullæa Grangeri, nov. spec.	...	...	...	...	...	c.	...	...
Cucullæa Hettangiensis, *Terq.*	...	x*	?	c.	...	...	...	*Cave Hill, =Arca Lycetti, *Moore*
Cucullæa oxynoti, *Quenst.*	..	..	..	..	v.r.	..	..	..
Gervillia acuminata, *Terq.*	...	...	x.	...	...	...	...	=Avicula lanceolata, *Sow.*
Goniomya Sinemuriensis, *Op.*	...	...	...	v.r.	?	x.	...	...
Hippopodium ponderosum, *Sow.*	...	...	...	...	...	x.	...	Col. Geol. Survey of Ireland.
Hinnites angularis, nov. spec.	...	...	...	r.	...	...	...	...
Leda Bronni, *Andler*	...	...	...	x.	x.	x.	...	...
Leda Dewalquei, *Terq & Piette*	...	...	...	...	x.	...	...	...
Leda Quenstedti, nov. spec.	...	...	x.	x.	x.	x.	...	...
Leda Renevieri, *Oppel.*	...	...	x.	x.	x.	...	...	...
Leda v-scripta, nov. spec.	...	...	...	v.r.	...	...	...	...
Leda tenuistriata, *Piette*	...	...	...	x.	?	x.	...	...
Lima gigantea, *Sow.*	...	...	...	v.c.	...	...	...	...
Lima Hettangiensis, *Terq.*	...	...	...	x.	x.	...	...	Island Magee.
Lima pectinoides, *Sow.*	...	...	x*	v.c.	x.	x.	...	*Portrush.
Lima præcursor, *Quenst.*	x.	...	...	...	...	..	...	...
Lima punctata, *Sow.*	...	...	...	c.	...	...	...	...
Lima succincta, *Ziet*	...	...	x*	x.	...	...	...	*Portrush.
Lima Terquemi, *Tate*	...	...	...	c.	...	...	...	=Lima exaltata, *Terq.*
Lima Valoniensis, *Def.*	x.	...	...	...	...	...	...	Col. Geol. Survey of Ireland.

TABLE—(CONTINUED.)

List of Species.	Distribution.							
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	Avicula Shales.	White Lias.	A. planorbis Zone	A. angulatus Zone.	A. Bucklandi Limestones.	Belemnite Shales.	Ballintoy Marls.	
Limea acuticosta, *Goldf.*	...	...	...	...	...	...	c.	...
Myoconcha oxynoti, *Quenst.*	...	...	...	...	...	x.	...	...
Myoconcha pellonoti, *Quenst.*	...	...	...	x.	...	...	...	Garron Point.
Mytilus glabratus, *Dunk.*	...	...	...	x.	...	...	...	...
Mytilus Hillanus, *Sow*	...	...	...	x.	...	...	...	...
Mytilus lævis, *Sow*	...	...	...	c.	...	...	...	...
Mytilus minimus, *Sow*	x.	x.	x.	...	...	...	...	...
Mytilus minutus, *Goldf.*	x.	x.	...	...	...	...	...	...
Mytilus Gueuxii, *D'Orb*	...	...	...	x.	?	x.	...	..
Mytilus lamellosus, *Terq.*	...	...	...	x.	...	...	..	Island Magee.
Mytilus rusticus ? *Terq.*	..	..	...	x.	..	..	..	..
Mytilus subtilis, nov. spec.	...	...	v.r.	..	..	..	...	..
Lucina limbata ? *Terq. & P.*	...	...	..	x.	x.	x.	...	...
Myophora Emmerichi,	x.	..	...	...	...	...	...	...
Nucula navis, *Piette*	...	...	...	x.	...	...	..	...
Ostrea arcuata, *Lamk.*	...	...	...	r.	v.c.	...	...	..
Ostrea MacCullochi, *Sow*	...	...	...	...	x.	x.	...	...
Ostrea cymbium, var. obliqua, *Sow.*	...	...	...	...	...	x.	...	...
Ostrea irregularis, *Münst*	x.	x.	x.	x.	...	...	...	...
Pecten acutiradiatus, *Ziet.*	...	...	...	...	...	..	v.c.	...
Pecten lunularis, *Röm.*	...	...	x.	x.	...	...	...	=Pecten Hehlii, *D'Orb.*
Pecten linsinus, *Nyst*	...	...	...	...	...	...	r.	...
Pecten punctatissimus, *Quenst.*	...	...	...	x.	...	...	...	Glenarm, &c.
Pecten textorius, *Goldf.*	...	...	...	x.	...	...	...	...
Pecten texturatus, *Goldf.*	...	...	...	..	..	c.	...	..
Pecten Valoniensis, *Defr.*	x.	..	..	...	...	...	...	...
Pecten dextilis, *Röm.*	...	...	x*	x.	...	...	..	*Portrush.
Perna infraliasina, *Quenst.*	...	...	x.	x.	...	...	...	...
Pinna folium, *Y. & B.*	...	...	...	x.	...	...	...	?=Pinna semicostata, *T. & P.*
Pinna Hartmanni, *Münst*	...	...	...	x.	...	? r.	...	...
Plicatula Deslongchampsi, *Terq.*	...	...	...	v.r.	...	...	...	Waterloo.
Plicatula Hettangiensis, *Terq.*	...	...	...	x.	...	...	...	...
Plicatula intusstriata, *Emmer.*	x.	?	?	x.	...	...	...	...
Plicatula spinosa, *Sow*	...	...	...	...	...	x.	v.c.	...
Plicatula sarcinula, *Münst.*	...	...	...	..	...	x.	...	...
Pleuromya galatea, *Ag.*	..	..	...	x.	...	...	...	...
Pleuromya liasina, *Schubl.*	...	...	..	...	...	x.	...	...
Pleuromya striatula, *Ag.*	...	...	...	x.	?	x.	...	...
Pleuromya crassa, *Ag.*	...	x.	...	...	...	...	...	...
Pholadomya glabra, *Ag.*	...	...	x.	x.	?	x.	...	...
Pholadomya Fraasi, *Oppel*	...	...	...	x.	...	...	...	...
Pholadomya ventricosa, *Ag.*	...	...	...	r.	...	...	...	Waterloo.
Terquemia arietes, *Quenst.*	...	...	...	x.	?	x.	...	...
Thracia æquata, nov. spec.	...	...	...	v.r.	...	...	...	...
Unicardium cardioides, *Phil.*	...	...	x.	c.	?	c.	...	...
Class BRACHIOPODA.								
Discina Holdeni, *Tate*	...	...		x.	...	...	...	...
Lingula Metensis, *Terq.*	...	...	...	x.	?	x.	..	...
Rhynchonella acuta, *Sow*	...	...	...	...	...	...	r.	...

TABLE—CONTINUED.)

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	Avicula Shales.	White Lias.	A. planorbis.	A. angulatus Zone.	A. Bucklandi Limestones.	Belemnite Shales.	Ballintoy Marls.	
Rhynchonella plicatissima, *Quenst*..	...	...	..	...	r.	r.	...	...
Rhynchonella variabilis, *Schloth*...	..	..	..	...	...	...	r.	..
Waldheimia numismalis, *Lamk*....	..	..	...	..	..	..	r.	..
Waldheimia perforata, *Piette*.....	..	..	..	x.	?	x.	..	..
Class CRUSTACEA.								
Eryma? sp	..	..	..	x.	..	..	..	..
Cythere liassica, *Brodie*.....	..	..	x.	x.	x.	c.	..	..
Pollicipes alatus, nov. spec.....	..	..	..	x.	..	..	..	..
Class ANNELIDA.								
Serpula capitata, *Phil*.....	..	..	..	x.	..	..	..	..
Serpula globiceps, *Quenst*.....	..	..	..	x.	..	..	..	Waterloo.
Serpula olifex, *Quenst*.....	..	..	..	x.	..	..	..	..
Serpula socialis, *Goldf*.....	..	..	..	c.	..	..	..	..
Class ECHINODERMATA.								
Cidaris Edwardsii, *Wright*..... ...	..	..	..	v.c.	..	..	..	..
Pentacrinus scalaris, *Goldf*.....	..	..	..	..	v.c.	..	..	..
Pentacrinus sp.....	..	..	..	..	..	..	c.	..
Extracrinus Briareus, *Mill*.....	..	..	..	x.	..	..	..	..
Ophioglypha Gaveyi? *Wr*.....	..	..	..	v.r.	..	..	..	Island Magee.
Ophioglypha sp.....	x.	..	..	..	..	..	..	Larne, Geo. Survey.
Hemipedina Bechei, *Wr*.....	?x.	?	x.	x.	..	..	..	..
Class ZOANTHARIA.								
Montlivaltia Haimei, *Chap. & Dew.*	..	..	..	x.	x.	x.	..	..
Montlivaltia Hibernica, *Duncan*....	..	..	..	v.r.	..	..	..	Island Magee.
Montlivaltia papillata, *Duncan*	..	..	..	v.r.	..	..	..	Island Magee.
Montlivaltia polymorpha, *Tq. & Pte.*	..	..	..	x.	..	..	..	Garron Point.
Montlivaltia mucronata, *Duncan* .	..	..	..	x.	..	..	..	Coll. Geo. Survey of Ireland.
Oppelismilia gemmans, *Duncan*....	..	..	..	v.r.	..	..	..	Waterloo.
Septastræa Fromentell, *T. & P.* ...	..	..	..	r.	..	..	..	Island Magee.
Class FORANIMIFERA.								
Dentalina obliqua, ...	..	..	..	..	..	x.	..	..
PLANTÆ.								
Fucoides sp.	..	..	..	x.	..	..	..	..
Known,.....	24	11	22	118	21	44	16	
Inferred,....	..	2	2	2	12	..	..	
	24	13	24	120	33	44	16	Total, 189.

PALÆONTOLOGICAL NOTES

AND

DESCRIPTION OF NEW SPECIES.

1. BELEMNITES PRÆMATURUS, *Tate*, Geological Magazine, Vol. vi., p. 166 (1869).

Description.—Guard slightly sub-hastate, terminating in an acute central point, contracted in all regions about the alveolar apex, and tapering very gradually to the point. On the lateral faces of the anterior part of the guard there are two distinct furrows, which extend to about the middle part. Axis apparently straight. Phragmacone in its transverse section sub-oblong, the dorso-ventral diameter being the longer. Extreme length ·35 inch; length of axis, so far as traceable, ·11 inch.

Geological Position.—Zone of "*Ammonites angulatus*," Lower Lias, Island Magee, Co. Antrim (2 Specimens; *R. T.*)

a. Outline, nat. size.
b. Enlarged.

Remarks.—The only other *Belemnites* in the Lower Lias of Ireland are *B. acutus*, and *B. pencillatus*, which occur in the marls at Ballintoy, at a much higher horizon than the shelly limestones whence *B. præmaturus* has been obtained. Naturally the question arises, may not this form be the young state of one or other of these species? The presence of lateral furrows in *B. præmaturus* precludes such a relationship. The affinity to *B. clavatus*, Bl., is more obvious, but it has not the elegant fusiform outline of the young of that species. Professor Phillips (Geol. Mag. Vol. vi., p. 239) remarks, that *B. præmaturus* must certainly be distinguished from every variety of *B. clavatus*, and may prove to be closely allied to *B. pencillatus*, which is by no means always deprived of lateral furrows.

B. præmaturus was published by me as the oldest-known British Belemnite, but Mr. C. Moore had obtained a very small conical specimen from beds immediately above those which yield *Ostrea liassica*; and the Rev. P. B. Brodie "a mere fragment from the insect beds (*'A. planorbis'* zone) at Bruton." Neither of these older specimens have received specific names.

2. AMMONITES MACDONNELLI, *Portlock*, Geol. Surv. Derry, p. 134 (1843).

Appears a good species; it has the general form of *A. planorbis*, with a thin prominent keel, and distant, faint, sigmoidal ribs on the outer whorl, in

the centre whorls the ribs are distinct, numerous, close, sharp and having only a slight sigmoidal bend. The species is peculiar to the Irish Lias.

3. CERITHIUM TENUICOSTATUM, *Portlock sp.*, Plate I. fig. 8.

Turritella (Cerithium) tenuicostata, Portlock, Geol. of Derry, p. 124 (1843).

This species was described by Portlock, in the following words :—"Whorls convex ; spiral threads of two sizes; three strong on the lower half of the whorl, and one fine below them. On the upper half there are four or five fine threads, which are very close together; whilst the strong threads of the lower half are separated by a considerable space. The fine threads are in like manner separated from the strong, by a space equal to the separating space of these lines. All these spiral threads are crenulated by numerous very fine-curved longitudinal threads, of which there must be more than 30 on a whorl. Very minute, 6 whorls in ·25 of an inch."

C. tenuicostatum is a very variable species ; when the medial longitudinal ribs are prominent, the whorls are bicarinated, as shown in fig 8, (*) which represents an extreme form; whilst on the other hand, as the threads assume less prominence, the whorls become proportionately more regularly convex. It agrees in all its characters, except that of size, with *C. Semele*, D'Orb., with which it is associated, and should further examination prove that *C. tenuicostatum* is only a depauperated condition of *C. Semele*, then Portlock's name has priority of publication.

4. CERITHIUM PERCINCTUM, *Portlock (Turritella)*, loc. cit., p. 123.

"Very minute, eight whorls in ·25 of an inch. Of the raised spiral lines, one along the centre of the whorl is more elevated than the others, and another below is nearly as much so—a finer line being between; which produces the appearance of a band. Above the stronger line there are three or four finer, though still well-marked lines; and below it also three or four, including the second stronger line."

I have not met with any shell that agrees with the above description, and the type appears to have been lost. But that no mention is made of transverse striæ, and indeed it must be conceded that none are present, because compared by Portlock, with *T. minuta*, K. & D., and *T. cingenda*, Sow., in which no transverse striæ occur, I should be disposed to regard this species as the bicarinated form of *C. tenuicostatum*.

5. CHEMNITZIA PUNCTATA, *nov. spec.*, Plate I. fig. 11.

Shell conical, whorls about six, sub-inflated, with numerous narrow depressed longitudinal costatulæ, with about equally broad slightly impressed sulci, which are regularly pitted ; the punctuations are ranked transversely by

* The transverse ribs are much finer and more numerous than shown in the figure ; and the whorls should have been more markedly bicarinated. (R. T.)

faint concentric striæ. The aperture is not exposed ; but I have no hesitation in referring the shell to the genus *Chemnitzia.*

Geological Position—Zone of "*A. angulatus,*" Island Magee, Co. Antrim (*S. A. Stewart*).

6. CHEMNITZIA BERTHAUDI, *Dumortier*, Études Pal. sur les Dépots Jurassiques du Bassin du Rhone, p. 174, tab. xiv, fig. 2, 1867.

Chemnitzia Tylori, Tate, Quart. Jour. Geol. Soc., Vol. xx, p. 313 (1867).

Shell turreted, elongated, consisting of ten whorls separated by a deep suture, concave, and ornamented by about twenty very prominent curved smooth ribs; the sulci faintly striated; base slightly carinated, smooth or faintly radiated. Total length ·3 inch, breadth of last whorl ·07 inch.

Affinities and Differences.—By its ornamentation closely allied to *C. costifera*, Piette, and *Cerithium Henrici*, Martin, but differs from the former apparently in the proportion of its dimensions, and in the less arched outline of the costæ ; and from the latter in being only about half the length of that shell, which is provided with only eight whorls. I have no hesitation in referring the shell I had described as *C. Tylori* to *C. Berthaudi*, Dumortier, which has priority by some months.

Geological Position.—C. Berthaudi is a common shell in the zone of "*A. angulatus,*" Island Magee, Co. Antrim. The type of the species is unique, and was obtained from the zone of "*A. Bucklandi*" at Peronne, Rhone.

7. SOLARIUM THOMSONI, *nov. spec.*, Plate I. fig. 9.

Shell orbicular, a little wider than high, spire slightly raised, composed of four whorls, smooth, or ornamented with about 6 raised lines; last whorl rounded, smooth ; aperture quadrate ; base flat, with fine striæ of growth ; umbilicus narrow and slightly crenulated on its border. Height, ·075 inch ; diameter, ·085 inch.

Remarks.—S. Thomsoni is allied to *S. lenticulare*, Terq., but differs in its more embracing whorls and Rotella-like appearance, in its smaller umbilicus, and its more conical form.

Geological Position—Zone of "*A. angulatus,*" Glenarm ; (rare, *R. T).*

The species is dedicated to Professor Wyville Thomson, F.R.S., President of the Natural History Society, Belfast.

8. CRYPTÆNIA BRYCEI. *Tate*, Quart. Jour. Geol. Soc., Vol. xxiii., p. 413 (1867). Plate I. fig. 13.

Shell subdiscoid, depressed ; test thin, whorls four, nearly flat or slightly concave ; bluntly carinated ; upper surface of the whorls transversely striated ; base convex, smooth ; callosity large, circumscribed by a sulcus, slightly excavated near the columella lip ; siphonal band narrow, rather above than below the keel ; aperture, sub-triangular.

Remarks.—*C. Brycei* is somewhat intermediate between *C. cæpa*, Desl., and *C. expansa*, Sow.; it is related to the latter by the concave and carinated whorls, by the band being above the keel, and by the large callus, but differs in its more regularly conoidal form, without the ventricosity of the under surface, and by the absence of the raised border to the posterior suture.

Geological Position.—Zone of "*A. angulatus*," Island Magee; (rare, *Gray & Tate*); Garron Point, Co. Antrim (*R. T*).

9. TORNATELLA ROBINSONI, *nov. spec.*, Plate I. fig. 7.

Shell ovate-oblong; spire produced, apex acute; whorls scalariform, a little obtuse, and with an elevated margin; the whole surface ornamented with fine longitudinal striæ, whilst from the posterior suture fine curved lines proceed to a little beyond the shoulder of the whorl; aperture ovate, acute; columella with a single plait.

Geological Position.—Zone of "*Belemnites acutus*," Ballintoy; very rare (Coll. Belfast Museum).

Dedicated to Mr. Hugh Robinson, one of the energetic Secretaries of the Belfast Naturalists' Field Club.

10. DENTALIUM PORTLOCKI, *nov. spec.*, Plate I. fig. 15.

1843 *Dentalium tenue*, Portlock. loc. cit., p. 118 (non Goldfuss, 1841).

1856 *Dentalium Andleri*, Oppel, Die Juraformation, p. 93 (probably).

1863 *Dentalium minimum*, pars, Tate, Quart. Jour. Geol. Soc., Vol. xx., p. 3.

1867 *Dentalium tenue*, Tate, id., Vol. xx., p. 311.

Remarks.—In 1863, I referred *D. tenue*, of Portlock, to *D. minimum*, Strickland, as I then considered the two names synonymous, adopting the latter, because the specific name applied by Portlock was pre-occupied by a *Dentalium* described by Münster, to which species his shell is not referable; at a later period I regarded them as distinct, and erroneously gave priority to Portlock's employment of the specific name. In giving the above denomination to the species described by Portlock, I wish to commemorate the labours of that geologist. The original diagnosis is as follows:—"The longest ·4 of an inch, is about ·04 of an inch in diameter at the largest end, and tapers to a fine point; it is very slightly curved." *D. Andleri*, Oppel, is probably a synonym to *D. Portlocki*; the only character given is, that it is small—"die kleine species;" but, assuming that the two names refer to the same species, the imperfect diagnosis of Oppel justifies me in discarding his name.

11. PLEUROTOMARIA TECTARIA, *nov. spec.*

Shell turbinated conical, scalariform, spire acute; whorls six, subquadrate, last whorl with two prominent carinæ, separated by a slightly concave area; surface of whorls strongly longitudinally striated, upper part of each whorl

cancellated by very fine oblique striæ. Siphonal band very narrow, occupying a slight depression on the upper carina, ornamented with three longitudinal striæ. Base imperforate, concentrically striated; aperture subquadrangular.

Dimensions.—Total length, ·9 inch; breadth of last whorl, ·6 inch; height of last whorl, ·4 inch.

P. Tectaria cannot be confounded with any Liassic species of the genus, though related to *P. subtilis*, Deslong. It resembles in figure, several Palæozoic forms, and especially *P. tornatilis*, Phil., from the Carboniferous Limestone.

Geological Position.—Zone of *A. angulatus*, between Garron Point and Red Bay, two examples (*R. T.*); Island Magee, one example (*S. A. Stewart*).

12.—HINNITES ANGULARIS, *nov. spec.*, Plate I. fig. 2.

Shell inequivale, subinæquilateral, thick, left valve convex, transversely oblong; umbo subacute, not extending beyond the hinge line, which is moderately arched; ornamented with crowded radiating ribs, unequal, obtuse, the surface of which is raised into spinous squamæ, and alternating irregularly with smaller and similarly ornamented costæ; costæ of umbonal region without spinous nodulations. Five or six of the radiating costæ are much stronger than the others, and somewhat regularly disposed, giving a polygonal outline to the valve. Ears ornamented as the rest of the shell. Right valve ornamented as the other valve. Breadth 2·5 inches, length 2 inches.

H. angularis agrees with *Lima nodulosa*, Terq., in the radiating spiniferous ribs, alternately large and small; but differs in the absence of rugous, serrated concentric striæ, and in its greater gibbosity, oblong figure, inequivalve character, and by the polygonal outline given to it by the larger ribs.

Geological Position.—Zone of "*A. angulatus*," Island Magee, two examples (*R. T.*); lowest beds of Lower Lias, Laleston, S. Wales. (*R. Etheridge*), Coll. Brit. Museum.

13.—AVICULA PATTERSONI, *nov. spec.*, Plate I. fig. 10.

Shell depressed, ovate, transverse, slightly oblique, concentrically striated; anterior margin arched, and superiorly sinuated; hinge line straight; anterior wing very short, acute; posterior wing elongated, acuminated, excavated behind.

A. Pattersoni has a general resemblance to *Gervillia crenatula*, Quenst., which the author states distinctly to possess cardinal pits, and as the type specimen of this species displays a single extended cartilage pit, it cannot be referred to that genus. It has much analogy with *A. Deshayesi*, Terqm., but is much less oblique, has a smaller anterior wing, and an acute umbo, not being so concave a shell as that species. This species was referred by Portlock to *A. Goldfussi*. Several specimens from Craig and Gortmore form part of the Portlockian collection. The figured specimen I obtained from the Zone of "*A. angulatus*" at Island Magee.

The species is dedicated to my kind friend Robert Patterson, Esq., F.R.S.

14.—LEDA V-SCRIPTA, *nov. spec.*, Plate I. fig. 5.

Shell elliptical; anterior portion rounded, ventricose; posterior elongated, rostrated; ventral margin strongly arched; medial portion of shell ornamented by plications *en chevron;* the rostral and anterior extremities with oblique plaits.

Geological Position.—Zone of "*A. angulatus*" Waterloo, Larne. Very rare; (*R. T.*)

15.—LEDA BRONNI, *Andler*, Neues Jarbuch f. Min., p. 642 (1858). See Plate I. fig. 1.

Nucula palmæ, Quenstedt, Jura, t. 13, fig. 42, p. 116, non t. 23, figs. 16.-17., t. 44., fig. 8. (1858).

This species resembles *L. subovalis* of the Middle Lias, from which it is especially distinguished, as pointed out by Andler, in the greater gibbosity of the umbonal region. It is common in the Zone of "*Belemnites acutus*" at Ballintoy, and occurs in the inferior zones. I have recorded it in England from the Zone of "*Ammonites Angulatus*" at Marton, Lincolnshire.

16.—LEDA QUENSTEDTI, *nov. spec.*, Plate I. fig. 4.

Nucula inflexa, Quenst., Jura, t. xiii., fig. 41, p. 110 (1858).

This species has been confounded by Quenstedt with *L. galathea*, d'Orbigny, a moderately common shell in the Middle Lias of England, France, and Germany, from which it is distinguished by its more robust and less inæquilateral form, and in the abruptly truncated posterior extremity.

Geological Position — Zones of "*A. planorbis*" Garron Point, and "*A. angulatus*," Island Magee, Co. Antrim (*R. T.*); Upper part Lower Lias, Ballintoy, Co. Antrim (*R. T.*); and Ofterdingen, Wurtemburg (*Quenstedt.*)

17. LEDA RENEVIERI, *Oppel*, Die Juraf., p. 95 (1857). See Plate I. fig 3.

Nucula complanata, Quenstedt, Jura, t. 13, fig. 39; p. 110 (1858).

The shell represented by fig 3, differs in a few particulars from the ordinary form of *L. tenuistriata*, Piette, but may be a young state of that species. Quenstedt's figure, which I have referred to, evidently represents the same species, which may be the one described by Oppel, in the following terms: —"Resembles *L. complanata*, Goldfuss, but does not attain the same size, and the anterior prolongation is shorter."

Geological Position. — Zone of "*A. Bucklandi*," Glynn, near Larne (*R. T.*) Recorded by Oppel in the Zone of "*A. angulatus*," and by Quenstedt, from the upper part of the Lower Lias in Swabia.

18. CUCULLÆA GRANGERI, *nov. spec.*, Plate I. fig. 12.

Cucullæa cucullata, Portlock, Geol. Survey of Derry, p. 120.

Shell ovate-rhomboidal, ventricose, rounded in front, and obliquely truncated behind, bluntly keeled from the umbo to the posterior angle; umbones

submedial, prominent, broad, high, and incurved. Ornamented with concentric striæ, varying in the degree of fineness; and radiating striæ, which are very fine, not distinctly visible without the aid of a magnifier, excepting on the anterior concave area. The striæ merge into impressed circular spaces on the superior margin of the transverse striæ, so that the surface, when viewed in certain positions, appears to be regularly punctated. Length, ·35 inch; breadth, ·5.

This species is not comparable with any of the Liassic *Arcidæ*; its peculiar ornamentation separates it from *C. cucullata*, Goldfuss.

Geological Position—Upper part of Lower Lias, Ballintoy, Co. Antrim *(Portlock, R. T., &c.)*, where it is very abundant.

Dedicated to my esteemed friend the Rev. John Grainger, A.M., the first President of the Belfast Naturalists' Field Club.

19. MYTILUS SUBTILIS, *nov. spec.*, Plate I. fig. 14.

Shell elongated, reniform, concentrically plicated and ornamented with closely-set radiating incised lines, which are visible only with the aid of a magnifier; dorsal margin curved; ventral margin sinuated; umbones approximately terminal, prominent, small, incurved.

Geological Position. — Lowermost beds of the Lower Lias, Cave Hill, Belfast; very rare *(S. A. Stewart)*. This species has the general form of *M. nitidulus*, Dunker, but is more cuneiform than that species, which does not possess the radial ornamentation.

20. MYOCONCHA OXYNOTI, *Quenstedt*, Jura, t. 13, fig. 34.

A single valve of a narrow cylindrical *Myoconcha*, forming part of the collection in the Belfast Museum, displays the internal characters, but as the exterior is unobservable, the shell cannot satisfactorily be referred to any species. Terquem describes a small species from the Lower Lias, and Quenstedt figures the internal cast of another form from the same formation, under the denomination of *M. oxynoti*.

The test of the Ballintoy specimen is very thin, and from the interior surface it is judged that the exterior is marked with concentric corrugations and fine lines of growths. The apparent absence of radiating lines removes it from *M. inclusa*, Terquem, and, as it agrees in shape with *M. oxynoti*, Quenstedt, I refer it to that problematical species.

Breadth, 1·4 inch; length, ·3 inch; thickness, ·1 inch.

Geological Position.—Zone of "*Belemnites acutus*," Ballintoy.

21. MYOCONCHA PSILONOTI, *Quenstedt*, Jura, t. 4, fig. 15 (1858).

? *Myoconcha scabra*, Terquem & Piette, Pal. de l'Est de France; t. 9, figs. 4-6 (1865).

? *Myoconcha scalprum, et M. spatula* (pars) D'Orbigny, Prodromus, Vol. I, p. 218 (1850).

I have no hesitation in referring the specimens named by D'Orbigny as above, and which I have examined, to *M. scabra* of Terquem & Piette, which I suspect is only the adult state of *M. psilonoti*. However, the Antrim shell agrees better with the latter. The species was known to Portlock, in whose collection it is labelled *Modiola, nov. spec.*

22. ASTARTE GUEUXII, *D'Orbigny*, Prodromus, Vol. 1. p. 216 (1850).

A. consobrina, Chapuis & Dewalque, Foss. du. Luxembourg, t. 22, fig. 3, p. 49 (1853).

A. complanata, et A. psilonoti, Quenstedt, Jura, t. 3, fig. 14 (1858).

A. dentilabrum, Etheridge, Quart. Jour. Geol. Soc., Vol. xx., p. 113 (1863).

This common *Astarte* I have compared with the type specimens of *A. Gueuxii*, to which I unhesitatingly refer it. M. Terquem has named specimens of *A. dentilabrum*, which I sent him, *A. consobrina*; so that the synonymic terms may be considered well-established. Though D'Orbigny's name has priority of publication, it has not been generally accepted, because of the supposed incompleteness of the description, which runs thus :—"Species allied to *A. subtetragona*, Römer, but less carinated, less compressed, and costulated only in the young state."

Short as this diagnosis is, yet it is sufficient to its identification, and, consequently, the specific name *A. Gueuxii* should be used. *A. Eryx*, of the same author, is only a variety of this protean species; and *A. dentilabrum*, Etheridge, is founded on an aged form of the same species. The original description of *A. dentilabrum* is as follows :—"Shell massive, ovate, and deep. Postero-dorsal surface rounded, posterior end slightly truncate, about the position of the annal adductor to the ventral margin; anterior margin acutely rounded. Umbones small, indistinct, subcentral, slightly curved anteriorly. Lunule slightly excavated, small, oval, and attenuated, occupying half the area between the umbo and the commencement of the antero-ventral margin. Border angular; costæ concentrically arranged, and coincident with the contour of the shell. Ventral margin strongly denticulate. The whole of the teeth are inclined inwards, giving the edge of the shell a bevilled appearance—a marked feature in the shell."

23. PHOLADOMYA FRAASII, *Oppel*, Juraformation, p. 95.

The specific name here adopted was given by Oppel to a shell from the Lower Lias, agreeing in form with *P. ambigua*, Ziet., (*P. glabra*, Ag.), but possessing from 9 to 12 rather strong ribs, coarsely wrinkled concentrically. Quenstedt has described the same species in much the same words with the name *P. prima*, which, by the way, is a misnomer, inasmuch as the genus dates farther back than the Lower Lias, and other species besides occur in the lowest beds of the Lias.

24. CEROMYA GIBBOSA, *Etheridge*, Quart. Jour. Geol. Soc., Vol. xx., p. 112, figs. 3-4 (1863).

Isocardia Elea, D'Orbigny, Prodromus, Vol. i., p. 218 (1850).

"Shell ventricose, deep, especially at the umbonal region. Umbones small, sub-central, slightly curved or involute, leaving a wide and exposed lunular region, strongly marked by concentric ridges of growth. Anterior side produced, rounded and gaping. Posterior side attenuated, slightly truncate. Ventral margin much produced, giving the shell a nearly circular appearance. Height, 1·7 inch; depth, 1·3 inch; length, 2·1 inches."—Etheridge.

The specific identity of *C. gibbosa*, Etheridge, with *Isocardia Elea*, d'Orbigny, results from a comparison of the type specimens; the diagnosis of the latter is so imperfect as to claim no consideration from palæontologists. It is as follows: —"Grosse espèce bombée, triangulaire lisse, à crochets contournés."

Geological Position. — Zone of "*A. angulatus*," Island Magee, Co. Antrim; not rare *(Gray, Tate)*; Cotham, Bristol ! *(Napier)*; "*A. Bucklandi*" Zone, Lyme Regis ! *(Coll. Geol. Soc.)*; Lower Lias, Langres, Haute-Marne ! *(D'Orbigny.)*

25. THRACIA ÆQUATA, *nov. spec.*

Shell transversely oval, ventricose; umbones medial, obtuse; hinge line angulated; anterior extremity rounded; posterior extremity moderately obliquely truncated; a very faint keel proceeds from the umbo to the postero-ventral margin, ornamented with furrows and close set fine striæ, coincident with the ventral margin, which is arched. Breadth, ·55 inch; length, ·4 inch; thickness, ·25 inch.

It has much the shape of *T. lata*, Münster, from which it is distinguished especially by its ventricosity and curved front margin.

The genus *Thracia* has not yet been catalogued from English strata, older than the Inferior Oolite, and, indeed, if *Myacites mactroides*, Schlotheim, of the Lias, be not a Thracia, then the genus has till now been unknown below the Middle Lias. *T. rugosa*, Dunker, a Lower Lias shell, is considered to be a *Pleuromya*, and has been re-described as such under the name of *P. Dunkeri*, by Terquem, so that *T. æquata* is, at the present time, the oldest British example, if not the oldest-known species of the genus. I take this opportunity to announce the discovery, by Mr. E. Welford, of *T. glabra*, Agassiz, in the Upper Lias Clay at Eydon, where it was found associated with *Leda ovum*, *Inoceramus dubius*, and other species, which serve to fix its stratigraphical position in the Zone of "*Ammonites communis.*"

Geological Position.—Zone of "*A. angulatus*," Waterloo, Larne. Specimen unique. (*R. T.*)

26. ANATINA MYACINA, *nov. spec.*. Plate I. fig. 16.

Shell oblong, elliptical, umbones sub-central, small, ventricose, recurved

posteriorly; anterior margin rounded, posterior produced, obliquely? truncated (the posterior margin is represented in the figure as complete; the shell is imperfect in this region).

An obtuse, ill-defined keel proceeds from the umbo to the lower posterior angle, another to the upper posterior angle, enclosing a broad, deeply-impressed lunular area. Marked by concentric plications and fine striæ, and close-set radiating granular lines. Length, ·75 inch; breadth, 1·5 inch; thickness, ·5 inch.

Geological Position.—Zone of "*A. angulatus*," Island Magee, Co. Antrim.

27. DISCINA HOLDENI, *Tate*, Quart. Jour. Geol. Soc., Vol. xxiii., p. 314 (1867). id. Geol. Mag., Vol. vi., p. 6 (1869).

Discina sp., Terquem and Piette. Lias Inf. de l'Est de France; t. xiv., figs. 33-34, p. 113 (1865).

Shell small, regularly conical, base orbicular, the length and breadth in the proportion of about 5 to 4; summit central; test concentrically striated; colour, black to brownish-black; yellowish-brown in the young shell. Dimensions of an averaged sized specimen:—Diameters, 4·5 and 3·6 millimetres; height, 2·3 millimetres.

D. Holdeni is distinguished from the other Liassic species of the genus by its regularly conical form and central apex; and from *D. reflexa*, Sowerby, with which it has been confounded by the latter character.

Geological Position.—Ranges from the Zone of "*Ammonites angulatus*" to that of "*Ammonites Ibex*," in England, and throughout the Lower Lias in the East of France.

28. POLLICIPES ALATUS, *nov. spec.* Plate I. fig. 6.

The single scutal plate here figured is the one to which Mr. Etheridge (Quart. Jour. Geol. Soc., Vol. xx., p. 114, 1863) applied the M.S. name of *P. liassicus*; but, as another species was described by Dunker with a similar denomination, *P. liasinus*, it appears to me advisable not to adopt Mr. Etheridge's provisional name. I, therefore, have selected that of *P. alatus*.

Scutum triangular, flat, apex acute with a lateral wing-like extension upon the oceludent side; basal margin outwardly curved; the tergal margin inflated. Exterior surface marked with regular raised lines coincident with the basal margin, and which are prolonged on the wing-like projection, and on the enrolled tergal margin.

Geological Position.—Zone of "*A. angulatus*," Island Magee, Co. Antrim. Specimen unique. (*R. T.*)

The following diagnoses of new species of Corals, type specimens of which were obtained from the Lower Lias in County Antrim, are extracted from Dr. Duncan's Monograph of British Fossil Corals. Pal. Soc., Vol. xx., 1868.

OPPELISMILIA, *Duncan*, loc. cit., p. 39.

Corallum simple, attached and conical; epitheca well-marked, and reaches to the calicular margin. Calice shallow, and the septa numerous and close. There are no costæ, and there is no columella. Gemmation occurs within the calice; and the bud, which has an epitheca, grows with the parent.

The genus includes *Montivaltiæ* with calicular gemmation.

29. OPPELISMIILIA GEMMANS, *Duncan*, loc. cit., t. x, figs. 33-34, p. 39.

Corallum short, with a broad and flat calice, an oval space at the base, where it was once adherent; a strong epitheca with circular markings, and there are no costæ. Calice flat and shallow, and its margin is sharp. The septa are very numerous and unequal. The bud on the calice has an epitheca, and its septa are faintly dentate.

Height of the corallum, 5-10ths inch; width of the calice, 9-10ths inch.

Locality—Waterloo, Larne. (*R. T.*)

30. MONTLIVALTIA HIBERNICA, *Duncan*, loc. cit., t. x, figs. 22-23, p. 39.

Corallum discoidal, base flat; calice convex. Epitheca of the base strongly marked concentrically. Septa numerous, close, unequal, and marked by small papillæ, which are very close together, and by flat eminences which are also very close together. There appear to be nearly five cycles of septa, and the largest septa are papillose. Diameter, 4-10ths inch; height of corallum, 1-10ths inch.

Locality.—West shore of Island Magee. (*R. T.*)

31. MONTLIVALTIA PAPILLATA, *Duncan*, loc. cit., t. x., figs. 15-18, p. 36.

Corallum cyclolitoid in shape, base slightly concave; calice convex, with a circular depression in the centre. Epitheca of the base reaching to the calicular margin; it is very thin, and marked with concentrical shallow depressions and elevations, and the costæ are seen through it faintly. The calice is nearly circular. The septa are exsert, and the larger have very large dentations or papillæ on them. There are 24 septa, which reach the margin of the columellary space, and they are strongly papillated. Between two of the longest septa there are three others, one, the central, is longer than the others, which are almost rudimentary; all are papillate.

Diameter—10-12ths inch; height of corallum, 2-10ths inch.

Locality—West shore of Island Magee (*R. T.*); it occurs, also, at Marton near Gainsborough, on the same horizon; associated with *M. Haimei*, Chap. & Dew., and *Septastræa Fromenteli*, Terq. & Piette, as in the Irish locality.

Explanation of Plate.

Fig. 1.—*Leda Bronni:* End view and side view, natural size.

„ 2.—*Hinnites angularis:* Natural size.

„ 3.—*Leda Renevieri:* Slightly enlarged.

„ 4.—*Leda Quenstedti:* Natural size.

„ 5.—*Leda v-scripta:* Natural size, and enlarged.

„ 6.—*Pollicipes alatus:* Interior and exterior faces of a scutal plate, natural size.

„ 7.—*Tornatella Robinsoni:* Slightly enlarged, and magnified view of upper part of body whorl.

„ 8.—*Cerithium tenuicostatum:* Left hand figure, enlarged about two diameters; right hand figure, magnified view of one whorl.

„ 9.—*Solarium Thomsoni:* Natural size, and three enlarged views.

„ 10.—*Avicula Pattersoni:* Natural size.

„ 11.—*Chemnitzia punctata:* Natural size, and magnified view of a portion of the test.

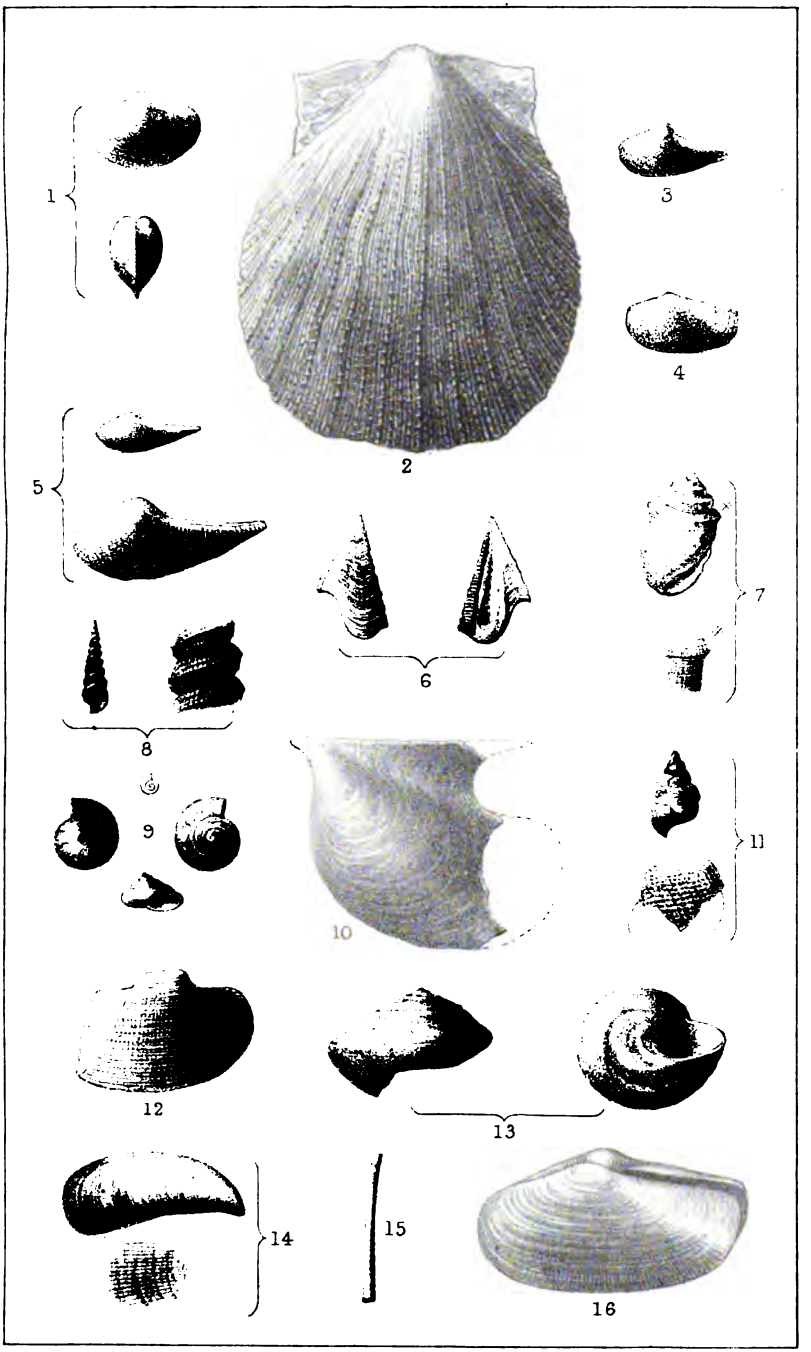
„ 12.—*Cucullæa Grangeri:* Enlarged about one and a-half diameters.

„ 13.—*Cryptænia Brycei:* Side view, and view of under surface, natural size.

„ 14.—*Mytilus subtilis:* Natural size, and magnified view of a portion of the test.

„ 15.—*Dentalium Portlocki:* Enlarged two diameters.

„ 16.—*Anatina myacini:* Natural size.



W. Parkes, del.

APPENDIX II.

A LIST

OF THE

Irish Triassic Foraminifera,

BY

JOSEPH WRIGHT, F.G.S., F.R.G.S.I.,

Hon. Assoc. of the Belfast Nat. Hist. and Phil. Soc., &c., &c.;

AND

A LIST OF THE

FOSSILS OF THE ESTUARINE CLAYS,

OF THE COUNTIES OF DOWN AND ANTRIM,

BY

SAMUEL ALEX. STEWART,

Fellow of the Botanical Society of Edinburgh, Hon. Assoc. of the Belfast Nat. Hist. and Phil. Soc.

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OCTOBER, 1871.

A LIST OF

IRISH LIASSIC FORAMINIFERA,

BY

JOSEPH WRIGHT, F.G.S., F.R.G.S.I.,

Hon. Assoc. of the Belfast Nat. Hist. and Phil. Soc., &c., &c.

MR. R. TATE, in his valuable paper on the Liassic fossils of Ireland, published by the Club in 1870, records one species of Foraminifera, *Dentalina obliqua*, from the locality of Ballintoy, County Antrim. This is, I believe, the first, and, indeed, only notice we have of fossil Foraminifera having been met with in any of our Irish rocks.

Shortly after this paper appeared, Mr. W. GRAY discovered two or three other Foraminifera in the same beds. On hearing of these discoveries was led carefully to examine these shales at Ballintoy, in the hope of being able to add more kinds to the few already known from that station; and through the kindness of several members of the Club, who supplied me liberally with the stone, I am now able to give the names of no less than 20 species.

Excepting one spot on Island Magee, where *Lingulina tenera* has been met with, the Ballintoy shale is as yet the only Lias known in Ireland in which Foraminifera have been found. The shale at this place is singularly favourable for yielding these lovely little organisms, for on the stone being placed in water, it almost immediately falls down into a fine impalpable

mud, on passing which through fine muslin the Foraminifera remain behind in the very finest preservation.

I cannot conclude these few remarks without expressing my sincere thanks to Dr. H. P. Brady, F.L.S., of Newcastle-on-Tyne, for the very valuable assistance he afforded me in correctly determining the names of the species.

NODOSARIA RAPHANUS, *Linn.* sp. Ballintoy. Rare.
NODOSARIA SCALARIS, *Batsch.* sp. Ballintoy. Rare.
NODOSARIA TETRAGONA, *Reuss.* Ballintoy. Very common.
NODOSARIA BOUCANA, *D'Orb.* Ballintoy. Rare.
NODOSARIA HUMILIS, *Römer.* Ballintoy. Rare.
GLANDULINA LÆVIGATA, *D'Orb.* Ballintoy. Very rare.
LINGULINA TENERA, *Bornemann.* Ballintoy; Islandmagee. Very common.
DENTALINA COMMUNIS, *D'Orb.* Ballintoy. Common.
DENTALINA OBLIQUA, *Linn.* sp. Ballintoy. Very common.
VAGINULINA LEGUMEN, *Linn.* sp. Ballintoy. Very rare.
VAGINULINA LÆVIGATA, *Römer.* Ballintoy. Common.
VAGINULINA STRIATA, *D'Orb.* Ballintoy. Common.
MARGINULINA RAPHANUS, *Linn.* sp. Ballintoy. Very Common.
MARGINULINA LITUUS, *D'Orb.* Ballintoy. Rare.
MARGINULINA ENSIS, *Reuss.* Ballintoy. Common.
PLANULARIA BRONNI, *Römer.* Ballintoy. Rare.
CRISTELLARIA CREPIDULA, *F. & M.* sp. Ballintoy. Rare.
CRISTELLARIA ACUTAURICULARIS, *F. & M.* sp. Ballintoy. Very common,
FRONDICULARIA STRIATULA, *Reuss.* Ballintoy. Common.
FRONDICULARIA AUGUSTATA, *Nilsson.* Ballintoy. Common.

APPENDIX II.

ERRATA AND ADDENDA.

The paging after page 38 should be as follows:—Page 37 should be 39, 38 should be 40, 39 should be 41, 40 should be 42.

Page 26, line 4. For "Dr. H. P. Brady" read "Dr. H. B. Brady."

,, 29, line 5. For "*Convolvulus bidentatus*" read "*Conovulus bidentatus.*"

,, 29, line 18. For "LCUNA DIVARICATA" read "LACUNA DIVARICATA."

,, 29, line 20. For "LACUNA PALIDAUL" read "LACUNA PALIDULA."

,, 30, line 15. For "*scalaria Turtonis*" read "*Scalaria Turtonis.*"

,, 31, line 4. For "MUREX ERINACEOUS" read "MUREX ERINACEUS."

,, 32. line 29. For "TILUS ADRIATICUS VAR. OVALIS" read "MYTILUS ADRIATICUS, VAR. OVALIS." (In some copies only.)

,, 33, line 10. For "*Cardiam pygmœum*" read "*Cardium pygmœum.*"

,, 34, line 36. For "THRACIA PUBESCANS" read "THRACIA PUBESCENS."

,, 35, line 12. For "*Gastrochœnia modiolina*" read "*Gastrochœna modiolina.*

,, 35. After TEREBELLA CONCHILEGIA, add

ECHINUS MILIARIS, *Leske.* Very abundant in the *Thracia convexa* zone of the Belfast Estuarine Clay. Near the upper limit of this zone I found a bed marked by a closely-packed layer of the shells of this urchin. The shells are of large size. The species still lives abundantly in our bay.

AMPHIDOTUS CORDATUS, *Pennant.* Specimens of this "heart urchin" are scattered throughout the *Thracia convexa* zone in the Belfast bed, but not plentifully. This species occurs on the County Down coast, but I am not aware of its living in Belfast Lough. A sandy bottom is the *habitat* usually assigned to this urchin, but our fossil specimens must have lived on a bottom entirely muddy.

examining them, though I have in my possession some of the shells from the Estuarine Clay of the Bann. In such inlets as those of Loughs Larne and Strangford, into which there are no rivers of any note carrying sediment, these Post-Pliocene clays are indicated by accumulations of small extent, but characterised by the presence of shells, in most part the same as those living in the adjoining waters.

A list of the Belfast clay shells was made out by John Grainger, Esq., and published by the British Association in their Report for 1852. A second list by Mr. Grainger, recording all the species known to occur in this bed at that date, was published in the *Natural History Review* for 1859. By the excavations for the recently constructed floating dock and basin, I have been enabled to examine this clay to a depth of twenty feet over a considerable area. The results are the addition of a goodly number of species to Mr. Grainger's lists, and the conviction that there is evidence that since the basement portion of that clay was laid down, there have been several oscillations of the sea-level; these oscillations can be shown by a comparison of the different sets of shells, found at various depths in the clay.

The Larne Lough Estuarine Clay may be seen on the shore close to Magheramorne railway station: shells occur in it abundantly, many of the *testacea* being among our rarer species. This deposit is rich in *Foraminifera*, and in the smaller forms of Mollusca, especially univalves. It has been only slightly examined, and would doubtless yield many more fossils if scrutinised as closely as the corresponding bed at Belfast. At Strangford Lough I have seen the Estuarine clay near Newtownards, but have had little opportunity of investigating the bed at that place.

ANNOTATED LIST OF SPECIES.*

HELIX NEMORALIS. Mr. Grainger records the finding of one specimen of this land shell. I met with it two or three times.

HELIX ROTUNDATA. One specimen (Grainger).

ZONITES NITIDULUS. Two specimens (Grainger).

MELAMPUS BIDENTATUS, *Convolvulus bidentatus*, F. & H. Larne Lough bed, rare.

PATELLA VULGATA. One specimen (Grainger).

TECTURA VIRGINEA, *Acmæa virginea*, F. & H. Very rare. (One young specimen.)

FISSURELLA GRÆCA, *Fissurella reticulata*, F. & H. Belfast bed, rare.

CYCLOSTREMA NITENS, *Trochus pusillus*, F. & H. Plentiful in the Larne Lough deposit.

TROCHUS MAGUS. Of large size, but rare.

TROCHUS CINERAREUS. Abundant both at Belfast and Larne.

TROCHUS UMBILICATUS. At Larne Lough, scarce and small.

LACUNA CRASSIOR. Found by Mr. Grainger in the Estuarine Clay of Belfast. I have not myself met with specimens.

LCUNA DIVARICATA, *Lacuna vincta*, F. & H. Occurs in some plenty.

LACUNA PUTEOLUS. Larne Lough, scarce.

LACUNA PALLIDAUL. In the Larne Lough deposits, scarce.

LITTORINA OBTUSATA, *Littorina litoralis*, F. & H. Frequent.

LITTORINA OBTUSATA, VAR. ÆSTUARII. Belfast, rare.

LITTORINARUDIS. Scarce.

LITTORINA RUDIS, VAR. TENEBROSA. Scarce.

LITTORINA LITOREA. Abundant, especially in the † Scrobicularia bed.

RISSOA INCONSPICUA. In great abundance.

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* I have used the names adopted by Mr. Jeffreys in his Manual of British Conchology. Where the names given by Forbes and Hanley are different, they appear here as synonyms.

† See abstract of paper read by the author on 8th March, in Eighth Annual Report of Belfast Naturalists' Field Club (1871).

RISSOA MEMBRANACEA, *Rissoa labiosa*, F. & H. Profusely abundant, and of large size.

RISSOA VIOLACEA, *Rissoa rufilabrum*, F. & H. Not uncommon.

RISSOA STRIATA. Larne Lough, in profusion.

RISSOA VITREA. In the Belfast deposit, rare.

HYDROBIA ULVÆ, *Rissoa ulvæ*, F. & H. Frequent in the Estuarine Clays of Belfast, Larne, and Strangford Loughs.

HOMALOGYRA ATOMUS, *Skenea nitidissima*, F. & H. Abundant in the clay at Magheramorne.

HOMALOGYRA ROTA, *Skenea rota*, F. & H. With the last species, but rare.

CÆCUM GLABRUM. Larne Lough, rare.

TURITELLA TEREBRA, *Turitella communis*, F. & H. Plentiful, and very large.

SCALARIA TURTONÆ, *scalaria Turtonis*, F. & H. Plentiful in the Belfast bed.

ACLIS SUPRANITIDA. Belfast bed, very rare.

ODOSTOMIA MINIMA. This rare little univalve is for the first time recorded as an Irish Shell. One specimen only occurred to me.

ODOSTOMIA PALLIDA, *Odostomia eulimoides*, F. & H. Mr. Grainger recorded this shell from the Belfast deposit. I have found it at Magheramorne, where it is rather scarce.

ODOSTOMIA ACUTA. Belfast and Larne beds, rare.

ODOSTOMIA INDISTINCTA, *Chemnitzia indistincta*, F. & H. Rare.

ODOSTOMIA INTERSTINCTA. Very rare.

ODOSTOMIA LACTEA, *Chemnitzia elegantissima*, F. & H. Belfast and Larne beds, not uncommon.

EULIMA BILINEATA. One specimen found by Mr. Grainger, and recorded as *E. subulata*. Dr. Grainger is now satisfied that the name I have adopted is right.

NATICA CATENA, *Natica monilifera*, F. & H. Very scarce.

NATICA ALDERI, *Natica nitida*, F. & H. Commonly diffused through the clay.

APORRHAIS PES-PELICANI. In the greatest abundance.

CERITHIUM RETICULATUM. Everywhere throughout the deposit in abundance.

PURPURA LAPILLUS. A few specimens occurred, but this species may be reckoned among the rare shells of the Estuarine Clay.

BUCCINUM UNDATUM. Very common.

MUREX ERINACEOUS. Rare at Belfast, rather frequent at Larne.

FUSUS ANTIQUUS. Occurs occasionally, but not at all common.

NASSA RETICULATA. Frequent throughout the Clays.

NASSA PYGMEA. Very common. Mr. Grainger's *N. incrassata* belongs, I believe, to this "segregate." The distribution of these forms in our local Post-tertiary deposits seems to have been very fluctuating. *Nassa incrassata* occurs in our Glacial Clays, then disappears from our subsequently deposited Estuarine Clay, and finally reappears as the dominant form in our existing waters. *Nassa pygmea*, on the other hand, has not been found in our Boulder Clay, but in the Estuarine Clay is abundant, and now again ranks as a rare shell confined to the deep waters outside the bay.

DEFRANCIA GRACILIS, *Mangelia gracilis*. F. & H. Very rare, one specimen only.

PLEUROTOMA COSTATA, *Mangelia costata*. F. & H. One specimen, (*fide* Grainger).

PLEUROTOMA BRACHYSTOMA, *Mangelia brachystoma*. F. & H. Rather rare.

PLEUROTOMA SEPTANGULARIS, *Mangelia septangularis*. F. & H. Very rare.

PLEUROTOMA RUFA, *Mangelia rufa*, F. & H. "Belfast deposit" (J. Gwyn Jeffreys). By the Belfast deposit, I believe Mr. Jeffreys means our bed of Estuarine Clay. Nevertheless, few discriminate sufficiently between the Estuarine Clay and the raised beaches occurring here. The latter I have excluded from my list.

PLEUROTOMA TURRICULA, *Mangelia turricula*. F. & H. Rare.

CYPRÆA EUROPÆA. Two or three specimens only of our British cowry occurred to me.

CYLICHNA NITIDULA. In the Belfast bed I found one shell.

UTRICULUS OBTUSUS, *Cylichna obtusa*. F. & H. In the Larne, and also in the Strangford Lough Estuarine Clay, rare.

UTRICULUS HYALINUS, *Amphisphyra hyalina*, F. & H. Plentiful in the Belfast and in the Larne beds, but so fragile that specimens can scarcely be secured.

ACERA BULLATA, *Akera bullata*, F. & H. In the Belfast bed abundantly, but restricted to the *zone of *Thracia convexa*. Plentiful also at Larne, where specimens are of small size, apparently the variety *nana*.

ACTÆON TORNATILIS, *Tornatella fasciata*, F. & H. Belfast deposit, (*fide* Grainger).

SCAPHANDER LIGNARIUS. Rare. Three or four specimens only.

PHILINE APERTA. In abundance.

ANOMIA EPHIPPIUM. This extremely variable shell is distributed throughout the clay in some plenty.

ANOMIA PATELLIFORMIS. Rare, (Grainger).

OSTREA EDULIS. Shell beds, made up nearly altogether of the common oyster, occurred near the base of the deposit, and again repeated near the upper surface.

OSTREA EDULIS, VAR. HIPPOPUS. Immense shells of this deep-water variety scattered through the clay, mainly in the median portion of the deposit.

PECTEN VARIUS. Generally distributed and abundant.

PECTEN OPERCULARIS. Along with the last species, and almost equally abundant.

PECTEN MAXIMUS. Scattered throughout, rather plentifully.

LIMA HIANS. Very rare in the Belfast bed, abundant in the corresponding deposit in Larne Lough.

MYTILUS EDULIS. Abundant, especially in the basal and superficial portions of the clay.

MYTILUS MODIOLUS, *Modiola modiolus*, F. & H. Rare at Belfast, plentiful in the Larne bed.

MYTILUS ADRIATICUS, *Modiola tulipa*, F. & H. Occurs both at Belfast and Larne, but is rare.

TILUS ADRIATICUS, VAR. OVALIS. "Occurred in excavating a channel in Belfast Harbour" (J. G. Jeffreys). Some specimens dug out at the site of the new floating dock appear to belong to this variety.

MODIOLARIA MARMORATA, *Crenella marmorata*, F. & H. Very rare at Belfast, frequent at Larne.

NUCULA NUCLEUS. Very abundant in the Belfast beds; rare at Larne.

LEDA MINUTA, *Leda caudata*, F. & H. A single valve, (Grainger).

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* See abstract of paper read by the author on 8th March, in Eighth Annual Report of Belfast Naturalists' Field Club (1871).

MONTACUTA BIDENTATA. Frequent at Belfast; occurs in the Larne Lough bed in profusion.

MONTACUTA FERRUGINOSA. In the Belfast bed, rare.

LUCINA BOREALIS. Belfast bed, rare, but very large and tumid. The normal form occurs abundantly in the Larne Lough deposit.

AXINUS FLEXUOSUS, *Lucina flexuosa*, F. & H. Abundant and luxuriant.

CYAMIUM MINUTUM, *Turtonia minuta*, F. & H. Rare in the Belfast Estuarine Clay, plentiful in the similar bed at Larne Lough.

CARDIUM ECHINATUM. Occurs in great profusion, and very fine.

CARDIUM EXIGUUM, *Cardiam pygmæum*, F. & H. Occurs rather frequently in the Belfast deposit, but generally as single valves. More plentiful at Larne, and often complete.

CARDIUM NODOSUM. In the Larne Lough bed, very rare.

CARDIUM EDULE. Very abundant, especially in the upper and lower zones. Some of the shells, if not fully entitled to be considered as belonging to the variety *rusticum*, certainly approach that estuarine form very closely.

CARDIUM NORVEGICUM. Very rare. Mr. Grainger found one valve, and two or three valves occurred to me.

CYPRINA ISLANDICA. Very rare. I found one perfect specimen in the *Thracia convexa* zone of the Estuarine Clay.

VENUS LINCTA, *Artemis lincta*, F. & H. Occurs occasionally dispersed through the clay, but usually in single valves.

VENUS CASINA. Frequent in the Larne Lough deposit, mostly in single valves.

VENUS OVATA. Frequent at Larne, specimens small.

VENUS GALLINA, *Venus striatula*, F. & H. Diffused through the beds, form variable.

TAPES AUREUS. Common in the Larne Estuarine bed, not rare in the Belfast bed.

TAPES AUREUS, VAR. OVATA. Not uncommon, occurs both in the Larne and Belfast Estuarine Clays; attains a much greater size than the typical form.

TAPES PULLASTRA. Frequent, especially in the lower zone.

TAPES DECUSSATA. Shells of this littoral species occupy the lower portion of the clay in great profusion. Many specimens were much above the usual size.

LUCINOPSIS UNDATA. Very large, and diffused in immense numbers through the clay, except in the very oldest and very newest portions of the bed.

TELLINA BALTHICA, *Tellina solidula*, F. & H. Abundant, especially near the upper surface.

TELLINA TENUIS. Near the top, only sparingly, and of small size.

TELLINA SQUALIDA, *Tellina incarnata*, F. & H. Very rare. The only specimens I have seen were single valves collected by the late Wm. Thompson, Esq., and by Mr. William Darragh, of the Belfast Museum.

PSAMMOBIA FERROENSIS. Single valves frequent, perfect specimens rare.

PSAMMOBIA VESPERTINA. Mr. Grainger records finding a single valve of this species.

MACTRA SUBTRUNCATA. Frequent, variable in size and shape.

MACTRA TRUNCATA. Scarce.

LUTRARIA ELLIPTICA. Frequent.

LUTRARIA OBLONGA. One specimen, (*fide* Grainger).

SCROBICULARIA ALBA, *Syndosmya alba*, F. & H. Scattered through the clay in immense numbers.

SCROBICULARIA PIPERATA. Occupies the lower zone of the clay in the greatest profusion, Rare or absent from the higher or more recently deposited portion of the bed.

SOLECURTIS ANTIQUATUS, *Solecurtis coarctatus*, F. & H. A single specimen, (*fide* Grainger).

SOLEN PELLUCIDUS. Distributed through the median portion of the bed in abundance.

SOLEN ENSIS. Occurs sparingly.

SOLEN VAGINA, *Solen marginatus*, F. & H. Rather frequent.

THRACIA PAPYRACEA, *Thracia phaseolina*. Frequent; shells often perfect. The form *T. villosiuscula* also occurs.

THRACIA CONVEXA. Perfect specimens of this fine shell are plentiful; their occurrence made it easy to recognise a well-marked zone of the clay, replete with species that live mostly at a depth of five to ten fathoms.

THRACIA PUBESCANS. One specimen. (Grainger).

CORBULA GIBBA, *Corbula nucleus*, F. & H. Plentiful, but mostly as single valves.

MYA ARENARIA. Frequent, but only in the most recent portion of the bed.

MYA TRUNCATA. Plentiful throughout; specimens very fine, and sometimes with the siphonal tubes preserved.

MYA BINGHAMI, *Sphænia Binghami*, F. & H. In the Larne Lough deposit, very rare.

PANOPEA PLICATA, *Saxicava rugosa*, young? F. & H. Plentiful at Belfast in one narrow zone of the clay bed. Not yet found living on the Irish coasts.

SAXICAVA RUGOSA. Larne Lough deposit, rare.

SAXICAVA RUGOSA VAR. ARTICA. Belfast bed, rare (Grainger).

GASTROCHÆNA DUBIA, *Gastrochænia modiolina*, F. & H. "Two portions of the curious flask-like tubes of this species were found in the deposits" (Grainger).

PHOLAS CANDIDA. Perfect shells imbedded in numbers at the base of the zone of *Thracia convexa*, and forming a line of demarcation between that zone and the *Scrobicularia* bed.

PHOLAS CRISPATA. In the clay where they had lived in some numbers; the specimens are very large, many of them being nearly double the usual dimensions of living examples. They occur only at the base of the *Thracia convexa* bed.

TEREDO NORVEGICA. The calcareous tubes of this "ship worm" are not rare in the clay; complete specimens now in the Belfast Museum were dug up while making sewers in the streets of the town.

CREUSIA VERRUCA. Belfast deposit, (Grainger).

CYTHERE ALBO-MACULATA. Belfast bed, rare. Not rare in the Larne Lough deposit.

PECTINARIA BELGICA. Belfast deposit, (Grainger.)

SERPULA TRIQUETRA. Belfast Estuarine Clay, on shells.

SERPULA VERMICULARIS. In the Belfast Clay, rare.

TEREBELLA CONCHILEGA. Belfast bed, (Grainger.)

POLYMORPHINA LACTEA. Rare.

POLYMORPHINA GIBBA, *Var. æqualis*. Rare.

PLANORBULINA MEDITERRANENSIS. Very rare.

POLYSTOMELLA CRISPA. Belfast and Larne bed, very abundant.

QUINQUELOCULINA BICORNIS. Belfast and Larne beds, scarce.

QUINQUELOCULINA SEMINULUM. In great abundance.

ROTALIA BECCARII. Extremely abundant, Belfast and Larne Lough.

SPIROLOCULINA LIMBATA. Rare.

SPIROLOCULINA PLANATULA. Very rare.

TRILOCULINA BRONGNAIRTII. Rare.

TRILOCULINA TRIGONULA. Common.

TRUNCATULINA LOBATULA. Not common.

VERNEUILINA POLYSTROPHA? Very rare.

In the foregoing list I have given estimates for the several species, approximating as near as possible to the abundance or paucity of specimens. These estimates are founded on careful observations, extending over some three years. In preparing them I have derived valuable assistance from Dr. Grainger's previously published lists, and I am confident that they may be relied on as in the main correct. Future excavations, if such be carried on in these beds, may possibly make slight modifications, but I am satisfied that on the whole the estimates here given will remain practically undisturbed.

In the table which follows, I have endeavoured to give for the North of Ireland the distribution of these species in Post-tertiary times. Unfortunately the unproductiveness of our Glacial beds renders one column rather imperfect. Out of 140 species here recorded, only 29, being 21 per cent., appear as glacial shells in this district. It cannot be doubted but that there existed a much greater community between the two *faunas*.

Species make their appearance in a locality, becoming more and more abundant until they reach their culminating point, from which they recede with more or less rapidity until finally they are replaced by others. Such is the history of many of the shells of our Estuarine Clay, and to make this record as useful and complete as possible, columns are here given, showing those now found living in the waters of our bay, and those living at present on the coasts of the North of Ireland, distinguishing them from such as have only been found as dead shells. These columns will, it is hoped, prove instructive. It will be seen that many species, now only found dead, existed here during some portion of the Estuarine Clay times in abundance; and it may be added that during that period some other species, now among the forms dominant in our waters, were either absent or rare.

Shells from Raised Beaches, and Quarternary Gravels, are not included in these lists, which have been rigidly restricted to species which certainly occur in the Estuarine Clay. Many Post-pliocene shells are thereby excluded, which have been recorded as from Belfast deposits. It is to be

hoped that members of the Belfast Naturalists' Field Club will not overlook the raised beaches that are so numerous in the district: a good catalogue of our raised beach shells would nearly perfect our knowledge of the local Post-pliocene marine *fauna*.

I am very much indebted to J. Gwynn Jeffreys. Esq., F.R.S., for his kindness in identifying for me all critical or doubtful shells; to Joseph Wright, Esq., F.G.S., who gave much valuable assistance in ascertaining the various forms of *Foraminifera* in the Estuarine Clay; and also to Dr. H. B. Brady, F.G.S., F.L.S., who kindly took the trouble to refer these forms to their proper species. To Rev. Dr. Grainger I am also indebted for permission to examine his valuable collections of shells of the Belfast Estuarine Clay.

TABLE OF LOCAL DISTRIBUTION.

List of Species.*	Fossil				Recent			
					Living		Dead Shells	
	Glacial Clay	Belfast Estuarine Clay	Larne Lough Est. Clay	Strangford Lough Est. Clay	Belfast Bay	Coast of the North of Ireland	Belfast Bay	Coast of the North of Ireland
GASTROPODA.								
Helix nemoralis, *Müll.*	..	x.	..	..	..	..	..	..
Helix rotundata, *Linn*	..	x.	..	..	..	..	..	..
Zonites nitidulus, *Drap.*	..	x.	..	..	..	..	..	..
Melampus bidentatus, *Mont*	..	..	x.	..	x.	x.	..	..
Patella vulgata, *Linn*	..	x.	..	..	x.	x.	..	..
Tectura virginea, *Mull.*	..	x.	..	..	x.	x.	..	..
Fissurella Græca, *Linn*	..	x.	..	..	x.	x.	..	..
Cyclostrema nitens, *Phil*	..	..	x.	..	..	..	x.	..
Trochus magus, *Linn*	..	x.	x.	..	x.	x.	..	..
Trochus cinerarius, *Linn.*	..	x.	x.	..	x.	x.	..	..
Trochus umbilicatus, *Mont*	..	..	x.	..	x.	x.	..	..
Lacuna crassior, *Mont*	..	x.	..	..	x.	x.	..	..
Lacuna divaricata, *Fabr*	..	x.	x.	..	x.	x.	..	..
Lacuna puteolus, *Turt*	..	..	x.	..	..	..	x.	x.
Lacuna pallidula, *Da Costa*	..	x.	x.	..	x.	x.	..	..
Littorina obtusata, *Linn*	..	x.	x.	x.	x.	x.	..	..
„ var, æstuaru, *Jeff*	..	x.	..	..	..	..	..	..
Littorina rudis, *Maton*	..	x.	..	x.	x.	x.	..	..
" var, tenebrosa, *Mont*	..	x.	..	..	x.	x.	..	..
Littorina litorea, *Linn*	x.	x.	x.	x.	x.	x.	..	..
Rissoa inconspicua, *Ald*	..	x.	x.	..	..	..	x.	x.
Rissoa membranacea *Adams*	..	x.	x.	..	x.	x.	..	..
Rissoa violacea, *Desm*	..	x.	x.	..	x.	..	..	x.
Rissoa striata, *Adams*	..	..	x.	..	x.	x.	..	..
Rissoa vitrea, *Mont*	..	x.	..	..	..	..	x.	..
Hydrobia ulvæ, *Penn*	..	x.	..	x.	x.	x.	..	..
Homalogyra atomus, *Phil*	..	..	x.	..	..	x.	..	..
Homalogyra, rota, *F. & H*	..	..	x.	..	..	..	..	x.
Cæcum glabrum, *Mont*	..	..	x.	..	..	..	x.	..
Turittella terebra, *Linn*	x.	x.	x.	..	x.	x.	..	..

* I have placed each species in the column for dead shells, unless there is some record of them being taken alive, or that I myself know of their living here.

List of Species.	Fossil.				Recent.			
					Living		Dead Shells	
	Glacial Clay	Belfast Estuarine Clay.	Larne Lough Est. Clay	Strangford Lough Est. Clay	Belfast Bay	Coast of the North of Ireland	Belfast Bay	Coast of the North of Ireland
GASTROPODA.								
Scalaria Turtonæ, *Turt.*	..	x.	..	..	..	..	..	x.
Aclis supranitida, *S. Wood*	..	..	x.	..	..	..	x.	x.
Odostomia minima, *Jeff.*	..	..	x.	..	..	..	..	..
Odostomia pallida, *Mont.*	..	..	x.	..	x.	x.	..	..
Odostomia acuta, *Jeff.*	..	x.	x.	..	..	..	x.	..
Odostomia indistincta, *Mont.*	..	x.	..	..	..	..	x.	x.
Odostomia interstincta, *Mont*	..	x.	..	..	..	..	x.	x.
Odostomia lactea, *Linn*	..	x.	x.	..	..	..	x.	x.
Eulima bilineata, *Ald.*	..	x.	..	..	..	x.	x.	..
Natica catena, *Da Costa*	x.	x.	..	..	..	..	x.	x.
Natica Alderi, *Forbes*	..	x.	..	..	x.	x.	..	..
Aporrhais pes-pelicani, *Linn.*	x.	x.	..	..	x.	x.	..	..
Cerithium reticulatum, *Da Costa*	..	x.	x.	x.	x.	x.	..	..
Purpura lapillus, *Linn.*	x.	x.	..	..	x.	x.	..	..
Buccinum undatum, *Linn*	x.	x.	x.	..	x.	x.	..	..
Murex erinaceous, *Linn*	x.	x.	x.	..	x.	x.	..	..
Fusus antiquus, *Linn*	x.	x.	..	..	x.	x.	..	..
Nassa reticulata, *Linn.*	x.	x.	..	..	x.	..	..	..
Nassa pygmea, *Lamk*	..	x.	..	..	x.	..	..	..
Defrancia gracilis, *Mont.*	..	x.	..	..	..	..	..	..
Pleurotoma costata, *Donovan*	..	x.	..	..	..	..	x.	x.
Pleurotoma brachystoma, *Phil.*	..	x.	..	..	..	..	..	x.
Pleurotoma septangularis, *Mont.*	..	x.	..	..	x.	x.	..	..
Pleurotoma rufa, *Mont.*	..	x.	..	..	x.	..	..	x.
Pleurotoma turricula, *Mont.*	x.	x.	..	.	..	..	x.	x.
Cypræa Europæa, *Mont.*	x.	x.	x.	..	x.	x.	..	..
Cylichna nitidula, *Lov.*	..	x.	..	..	..	..	..	x.
Utriculus obtusus, *Mont.*	..	..	x.	x.	..	..	x.	x.
Utriculus hyalinus, *Turt.*	..	x.	x.	..	..	..	..	x.
Acera bullata, *Mull.*	..	x.	x.	..	x.	x.	..	..
Actæon tornatilis, *Linn*	..	x.	..	..	..	..	x.	x.
Scaphander lignarius, *Linn*	..	x.	..	..	x.	..	..	x.
Philine aperta, *Linn*	..	x.	..	..	x.	..	..	..

List of Species.	Fossil.				Recent.			
					Living.		Dead Shells.	
	Glacial Clay	Belfast Estuarine Clay	Larne Lough Est. Clay	Strangford Lough Est. Clay	Belfast Bay	Coast of the North of Ireland	Belfast Bay	Coast of the North of Ireland
CONCHIFERA.								
Anomia ephippium, *Linn*	..	x.	x.	..	x.	x.	..	..
Anomia patelliformis, *Linn*	..	x.	..	..	x.	x.	..	..
Ostrea edulis, *Minn*	x.	x.	x.	x.	x.	x.	..	..
„ „ var. hippopus, *Lamk*	..	x.	..	..	x.	..	..	..
Pecten varius, *Linn*	..	x.	x.	..	x.	x.	..	..
Pecten opercularis, *Linn*	..	x.	x.	..	x.	x.	..	..
Pecten maximus, *Linn*	x.	x.	x.	..	x.	x.	..	..
Lima hians, *Gmel*	..	x.	x.	..	..	x.	x.	..
Mytilus edulis, *Linn*	x.	x.	x.	x,	x.	x.	..	..
Mytilus modiolus, *Linn*	..	x.	x.	..	x.	x.	..	..
Mytilus Adriaticus, *Lamk*	..	x.	x.	..	x.	x.	..	..
Modiolaria marmorata, *Forbes*	..	x.	x.	..	x.	x.	..	..
Nucula nucleus, *Linn*	x.	x.	x.	..	x.	x.	..	..
Leda minuta, *Müll*	..	x.	..	..	x.	x.	..	..
Montacuta bidentata, *Mont*	..	x.	x.	..	..	..	x.	x.
Montacuta ferruginosa, *Mont*	..	x.	..	..	..	..	x.	x.
Lucina borealis, *Linn*	..	x.	x.	..	..	x.	x.	..
Axinus flexuosus, *Mont*	..	x.	x.	..	..	..	x.	x.
Cyamium minutum, *Fabr.*	..	x.	x.	..	x.	x.	..	..
Cardium echinatum, *Linn*	x.	x.	..	..	x.	x.	..	..
Cardium exigium, *Gmel*	..	x.	x.	..	..	x.	x.	..
Cardium nodosum, *Turt*	x.	..	x.	..	x.	x.	..	..
Cardium edule, *Linn*	x.	x.	x.	x.	x.	x.	..	..
Cardium Norvegicum, *Speng*	..	x.	..	..	x.	..	..	x.
Cyprina Islandica, *Linn*	x.	x.	..	..	x.	x.	..	..
Venus lincta, *Pult*	..	x.	..	..	..	x.	x.	..
Venus casina, *Linn*	..	..	x,	..	x.	x.	..	..
Venus ovata, *Penn*	x.	..	x.	..	x.	x.	..	..
Venus Gallina, *Linn.*	x.	x.	x.	..	x.	x.	..	..
Tapes aureus, *Gmel*	x.	x.	x.	x.	x.	..	..	x.
„ „ var. ovata, *Jeff*	..	x.	x.	..	..	.	..	..
Tapes pullastra, *Mont*	..	x.	..	..	x.	x.	..	..
Tapes decussatus, *Linn*	x.	x.	x.	..	..	..	x.	..
Lucinopsis undata, *Penn*	..	x.	..	..	..	..	x.	x.
Tellina balthica, *Linn*	x.	x.	..	..	x.	x.	..	..

List of Species.	Fossil.				Recent.			
					Living		Dead Shells	
	Glacial Clay	Belfast Estuarine Clay	Larne Lough Est. Clay	Strangford Lough Est. Clay	Belfast Bay	Coast of the North of Ireland	Belfast Bay	Coast of the North of Ireland
CONCHIFERA.								
Tellina tenuis, *Da Costa*	..	x.	..	..	x.	x.	..	..
Tellina squalida, *Pult*	..	x.	..	..	..	..	x.	x.
Psammobia ferroensis, *Chemn*	..	x.	..	..	..	..	x.	x.
Psammobia vespertina, *Chemn*	..	x.	..	..	..	..	..	x.
Mactra truncata, *Mont*	x.	x.	..	..	x.	x.	..	..
Mactra subtruncata, *Da Costa*	x.	x.	..	x.	x.	x.	..	..
Lutraria elliptica *Lamk*	..	x.	..	..	..	x.	x.	..
Lutraria oblonga. *Chemn*	..	x.	..	..	..	..	..	x.
Scrobicularia alba, *Wood*	..	x.	x.	..	x.	x.	..	..
Scrobicularia piperata, *Bellonius*	..	x.	..	..	..	..	..	..
Solecurtus antiquatus, *Pult*	..	x.	..	..	..	..	x.	x.
Solen pellucidus, *Penn*	..	x.	x.	..	x.	x.	..	..
Solen ensis. *Linn*	..	x.	..	..	x.	x.	..	..
Solen vagina, *Linn*	..	x.	..	..	..	..	x.	..
Thracia papyracea *Poli*	..	x.	..	..	..	..	x.	x.
Thracia pubescans, *Pult*	..	x.	..	..	..	..	x.	..
Thracia convexa, *W. Wood*	..	x.	..	..	..	..	x.	x.
Corbula gibba, *Olivi*	..	x.	x.	..	x.	x.	..	..
Mya arenaria, *Linn*	..	x.	..	..	x.	x.	..	..
Mya truncata, *Linn*	..	x.	..	..	x.	x.	..	..
Mya Binghami, *Turt*	..	..	x.	..	x.	..	..	..
Panopea plicata, *Mont*	..	x.	..	..	..	..	..	..
Saxicava rugosa, *Linn*	x.	x.	x.	..	x.	x.	..	..
,, ,. var. arctica, *F. & H.*	..	x.	..	..	x.	x.	..	..
Gastrochæna dubia, *Penn*	..	x.	..	..	..	..	..	..
Pholas candida, *Linn*	..	x.	..	..	x.	..	..	..
Pholas crispata, *Linn*	x.	x.	..	..	x.	..	..	..
Teredo Norvegica, *Speng*,	..	x.	..	..	..	..	x.	..
Class CRUSTACEA								
Cythere albo-maculata,	..	x.	x.	..	..	..	..	..
Creusia verruca, *Leach*	..	x.	..	..	..	x.	..	..
Class ANNELIDA								
Pectinaria belgica, *Pall*	..	x.	..	..	..	x.	..	..

List of Species.	Fossil.				Recent.			
					Living		Dead Shells	
	Glacial Clay	Belfast Estuarine Clay	Larne Lough Est. Clay	Strangford Lough Est. Clay	Belfast Bay	Coast of the North of Ireland	Belfast Bay	Coast of the North of Ireland.
Class ANNELIDA.								
Serpula vermicularis *Linn*	x.	x.	..	..	x.	x.	..	..
Serpula triquetra, *Linn*	..	x.	..	..	x.	x.	..	..
Terebella conchilega, *Pall*.....	..	x.	..	..	x.	x.	..	..
***Class RHIZOPODA.**								
Polymorphina lactea, *W. & J*.....	..	..	x.	..	..	..	x.	..
Polymorphina gibba, var. equalis, *W. & J.*	..	x.	x.	..	..	..	..	..
Planorbulina Mediterranensis, *D'Orb* ..	..	..	x.	.	..	..	..	..
Polystomella crispa, *Linn*.....	..	x.	x.	..	..	..	x.	..
Quinqueloculina bicornis, *W. & J*.....	..	x.	x.	..	..	..	x.	..
Quinqueloculina seminulum, *Linn*....	..	x.	x.	..	..	..	x.	..
Rotalina Beccarii, *Linn*.....	..	x.	x.	..	..	..	x.	..
Spiroculina limbata	..	x.	x.	..	..	..	..	..
Spiroculina planulata, *Lamk*.....	..	..	x.	..	..	..	..	..
Triloculina Brongniartii, *D'Orb*	..	..	x.	..	..	..	..	..
Triloculina trigonula, *Lamk*.	..	x.	x.	..	..	..	..	..
Truncatulina, lobatula, *W. & J*.....	..	..	x.	..	..	..	x.	..
Verneuilina polystropha ? *D'Orb*	..	..	x.	..	..	..	..	..

* As there is no evidence that any of the *Foraminifera* were taken alive on our coasts, I have been compelled to enter them in this table as dead shells. No doubt many of them lived here, but further information is required.

APPENDIX III.

A LIST

OF THE

Mosses of the North-East of Ireland

BY

SAMUEL ALEX. STEWART,

Fellow of the Botanical Society of Edinburgh; Hon. Assoc. of the Belfast Nat. Hist. and Phil. Soc.

AND

A LIST OF

The Cretaceous Microzoa

OF THE NORTH OF IRELAND,

BY

JOSEPH WRIGHT, F.G.S., F.R.G.S.I.,

Hon. Assoc. of the Belfast Nat. Hist. and Phil. Soc.

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A LIST OF

THE MOSSES OF THE NORTH-EAST OF IRELAND,

By SAMUEL ALEX. STEWART,

Fellow of the Botanical Society of Edinburgh ; Hon. Assoc. of the Belfast Nat. Hist. and Phil. Soc.

THE district referred to here comprises the counties of Down and Antrim, with a small portion of the county of Derry adjacent, a district presenting a great variety of contour, and a very considerable range in the rocks that come to the surface. The county of Down consists mainly of Silurian slates and grits, with protruded granite that rises to a height of between 2,000 and 3,000 feet in the Mourne range. Antrim is celebrated for its great basaltic plateau, which extends also into Derry, and has an area of more than 1,000 square miles of surface. Hard Chalk usually underlies the basalt, and is in many places succeeded by thin beds of Greensand, Lias, Keuper marls, and New Red Sandstone. Metamorphic rocks, and sedimentary rocks of the Palæozoic series, also occur extensively in Antrim and Derry, while superficial deposits, consisting of clay, sand, and gravel, of Quaternary age, frequently overlie and obscure the lower beds. The coast line measures about 170 miles, a very favourable circumstance for the bryologist.

A good deal of attention has been bestowed on the Mosses of this locality since the commencement of the present century. Many of the rarer forms have been already recorded in various publications, and several detached papers referring to them have been published, the latest being a short list in the Guide to Belfast and the Adjacent Counties, issued by the Belfast Naturalists' Field Club in 1874. None of these profess, however, to be complete, and the present is the first attempt at a moss-flora of this portion of the country.

From what has been already stated, the botanist will not hesitate to conclude that the North of Ireland is rich in mosses. And so it proves: the basalt

of Antrim and Derry is peculiarly favourable to their growth. The country is well watered, and the streams, that originate in the hills, everywhere find their way to the lowlands through little glens that are deep and bushy, affording not only delightful retreats for the lover of the picturesque, but also the very best *habitats* for these tiny plants. I have yet to learn that there is any happier way of spending a summer day than searching for plants beneath the spray of little cascades; or, with the melody of running waters in our ears, climbing from crag to crag in the hope of meeting with some of the rare and beautiful forms with which nature has enriched such spots. Our winters being usually very mild, the enthusiastic collector, who is not afraid to wet his feet, can pursue his occupation during the whole year.

The elevation of the hills is considerable. In Derry and Antrim they rise to 2,000 feet, and the Mourne range of mountains is one of the most important in Ireland. The moss-flora of the district has, however, one defect, there are but few of the species that flourish on limestone to be found here. This is, no doubt, owing to the fact that the Chalk seldom appears as a surface rock, it being usually displayed in steep escarpments of the hills, and in glens where the water has cut through it. In such places it rewards us with several rare species. Of the mosses here enumerated nine are now for the first time recorded as natives of Ireland; namely, *Hypnum giganteum*, *Fissidens incurvis* (Schwaeg), *Tayloria serrata*, *Mnium subglobosum*, *Zygodon rupestris*, *Pottia littoralis*, and *Seligeria calcarea*, with *Weissia crispula* and *Hypnum resupinatum*, collected long since in the north by Dr. Moore himself, but somehow overlooked by him when preparing his synopsis of the Irish mosses. The whole number here recorded amounts to 238 species: of these I have met with 200 myself, and as I do not consider the mere recording of a plant to be entirely sufficient (no matter by whom recorded), I have deposited my specimens in the Herbarium of the Natural History Society, at the Museum, Belfast, where they are available for public criticism. It may further be added, that in making up this list all doubtful or suspicious plants have been rejected. Hasty or spurious records are held in abhorrence by all real naturalists, and rigid accuracy has been preferred to an extensive but less reliable catalogue.

It is to be regretted that the large amount of work done by the late John Templeton, the pioneer of bryology in the North of Ireland, has not been ascertained and duly credited. Owing to the absence of his collection of mosses in Turner's herbarium, and the want of precision in the early records, this cannot now be done. Much still remains to be accomplished, notwithstanding the highly creditable labours of Templeton, Dr. Moore, and others. And although there is a large number of species here recorded, our knowledge of the moss-flora of the North of Ireland is still far from perfect, and the zealous student will doubtless find many species not mentioned. This is more especially to be expected in the case of barren plants, so often passed by, and so frequently difficult of determination.

With regard to the arrangement here followed, nothing has been attempted in the way of classification. That is a work much needed, and which I hope to see performed ere long by some of our leading bryologists, armed with an authority which shall make his arrangement permanent. The sequence followed here is that of the recent Synopsis of the British Mosses, by Mr. Hobkirk, but I have thought fit to invert the order, commencing this list where it has been the more common practice to end. This seems to be justified by the method of *phanerogamic* botanists, who commence with the higher forms and end with the lower. Whether right or wrong in this plan, at any rate no inconvenience will be caused, as it is as easy to read a list backwards as forwards.

The *habitats* here assigned to the different species, and the times of fruiting, are not copied from any other work, but are deduced from my own observation, extending over a period of eleven years, during which time these particulars have been carefully noted. In all cases in which I have not sufficient information I have omitted them. The numbers appended refer to the months during which fully formed capsules may be found, and until they commence to wither.

It now only remains to express my thanks to the kind friends who have given assistance in this work. And first to Mr. Charles P. Hobkirk, of Huddersfield, who, animated by that freemasonry which pervades real naturalists, undertook for me, a total stranger, the arduous labour of microscopically examining my plants, and confirming or correcting the names I had attached to them. I owe to that gentleman's acuteness the detection amongst my specimens of two rare British mosses, not previously observed in Ireland—viz., *Pottia littoralis* and *Zygodon rupestris*, with some other rare species which I had overlooked. I am also much indebted to Dr. David Moore, F.L.S., M.R.I.A., Dublin, for directing my attention to the collection of Antrim mosses in the herbarium of Royal College of Science, Dublin, and for kindly securing me the privilege of examining the specimens and noting localities. Dr. Moore, who occupies the leading place amongst Irish bryologists, has cheerfully facilitated this work, by advice on doubtful points, and by the communication of authentic specimens. I am also under deep obligations to the Rev. John Fergusson, Forfarshire, who assisted me with specimens, and helped me over many of my early difficulties. Without such help and encouragement it is probable this work would not have been persevered with.

I have also been favoured with the assistance of Mr. J. H. Davies, of Glenmore, Lisburn, who, with the greatest liberality, placed at my disposal the whole of his very large collection of mosses, which are intended for the Museum herbarium, and which will go very far to form a complete British series. Mr. J. Creeth, of Belfast, kindly favoured me with an inspection of a good collection of mosses made by him in the vicinity of Lisburn, and which included some plants I had not myself met with.

LIST OF SPECIES.

1. FONTINALIS ANTIPYRETICA. *Linn.*

On stones in streams—not uncommon. "Attached to wood and stones in the Co. Antrim rivers."—Moore, Herb. Coll. Sc. Dublin. Woodburn, Six-mile Water, Colin Glen (Antrim); in a well near Comber, and in stream at Newtownards Glen (Down).—S.A.S. Very luxuriant specimens may be found. I have met with examples having stems two feet in length. The fruit, which is seldom abundant, is to be looked for near the base of the stem. 5-7.

2. CRYPHÆA HETEROMALLA. *Dill.*

"Abundant on trees in Glenarm Demesne, but not common in Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. On an ash tree at Ballywalter (Co. Down).—S.A.S.

3. HOOKERIA LUCENS. *Dill.*

Damp, wooded banks of streams in hilly districts. This beautiful moss is widely distributed, but rarely abundant. "On moist shady banks in northern glens"—Moore, Herb. Coll. Sc. Dublin. Glenoe, Woodburn (Antrim); Cregagh Glen, Dundonald, Holywood Wood, Drumbo Glen (Down).—S.A.S. 12-1.

Neckera pennata is stated to have been found on trees in Colin Glen, near Belfast, but I believe there has been an error regarding this: it is certainly not there now.

4. NECKERA CRISPA. *Dill.*

Frequent on rocks in mountainous localities. "In fruit at the head of Glenariff, July, 1836."—Moore, Herb. Coll. Sc. Dublin. Glenarm, Sallagh Braes, Black Mountain, and Colin Glen (Antrim); Newtownards Glen, Slieve Donard (Down).—S.A.S.

5. N. COMPLANATA. *Linn.*

Trunks of trees, and rocks—not rare. "Frequent on trunks of trees through the Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. Redhall, Knockagh, Colin Glen (Antrim); Glenmachan, Mealough Hill (Down).—S.A.S. 12-3.

6. OMALIA TRICHOMANOIDES. *Dill.*

Hedge banks, rocks, and trees—common. Moneymore (Derry); Knockagh, Carnmoney Hill, Belfast Hills (Antrim); Castlereagh and Holywood Hills, Drumbo Glen (Down).—S.A.S. 10-2.

7. HYPNUM LOREUM. *Dill.*

Mainly on mountain heaths and bogs—not common. "Glenariff, and frequent on shady banks and under trees in Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. Plentiful on peat bog on summit of Slieve Gallion (Derry); ditch bank at Whitewell quarries, Cave Hill (Antrim); barren.—S.A.S. It fruits in the greatest profusion in a wood at Pomeroy, Co. Tyrone. I have found large specimens of *H. striatum* doing duty for this species in collections.

8. H. TRIQUETRUM. *Dill.*

Abundant in woods, and on shady banks throughout the district. 11-3.

9. H. SQUARROSUM. *Dill.*

Grassy fields, hedge banks, and heaths—everywhere abundant. Fruit seldom found, but occasionally abundant. 11-3.

10. H. BREVIROSTRE. *Ehr.*

Woods and glens in mountainous districts—frequent, but usually not abundant. "Glenariff, Glenarm, and Colin Glen."—Moore, Herb. Coll. Sc. Dublin. Carndaisy Glen near Moneymore (Derry); Woodburn Glens, Glynn, Carr's Glen near Belfast (Antrim); Newtownards Glen, Glenmachan, Slieve Croob (Down).—S.A.S. I have not found it in fruit.

11. H. SPLENDENS. *Dill.*

Abundant on heaths and damp banks—fruit rare. On hills of Derry, Antrim, and Down: at 2,200 feet on Slieve Donard (Down).—S.A.S. 3-5.

12. H. SCORPIODES. *Dill.*

"Bogs in the north, frequent but not in fruit."—Moore, Herb. Coll. Sc. Dublin. Boggy heath on Slieve Croob (Down).—S.A.S.

13. H. STRAMINEUM. *Dicks.*

"Of frequent occurrence—rare in fruit. Glenmakerron, June, 1836."—Moore, Herb. Coll. Sc. Dublin.

14. H. PURUM. *Dill.*

Shady glens, ditch banks, and mossy places in damp stony ground—fruit scarce. Common from Slieve Gallion (Derry), to Slieve Donard (Down). 10-12.

15. HYPNUM SCHREBERI. *Dill.*

Mountain moors and heathy wastes—frequent, but always barren.

16. H. CUSPIDATUM. *Dill.*

Marshy grounds throughout the district—abundant at both high and low elevations. 4-5.

17. H. CORDIFOLIUM. *Hedw.*

Bogs and marshes—not common. "On bogs, amongst *Sphagnum*, at Ballycastle."—Moore, Herb. Coll. Sc. Dublin. Boggy heath on Carrickfergus Commons (Antrim); peaty marsh near Moneyreagh (Down).—S.A.S.

18. H. GIGANTEUM. *Schimper.*

Boggy and stony heath—very rare. Carrickfergus Commons (Antrim); Slieve Croob (Down).—S.A.S. Not found elsewhere in Ireland.

19. H. PALUSTRE. *Linn.*

On stones in streams—common. 5-6.

VAR. B. SUBSPHŒROCARPON. *De Notr.* "On stones in streamlets flowing from the hills between Cushendall and Ballymena; near Carrickfergus."—Moore, Proc. R. I. Acad., Series II., Vol I., No. 8. I find in some cases the long nerve of this var., but can see no other difference.—S.A.S.

20. H. MOLLUSCUM. *Hedw.*

Abundant on rocks of various mineralogical characters through Derry, Antrim, and Down. Fruit usually scarce. 1-4.

21. H. RESUPINATUM. *Wils.*

Rare. "On trees, Glendun."—Moore, Herb. Coll. Sc. Dublin. On loose limestone blocks, Knockagh (Antrim).—S.A.S.

22. H. CUPRESSIFORME. *Dill.*

On stones, trees, and mossy banks. In profusion everywhere throughout Derry, Antrim, and Down—varies exceedingly. 11-2.

23. H. HAMULOSUM. *Frolich.*

Very rare. On chalk rocks. Crow Glen and Black Mountain, Belfast; barren.—S.A.S.

24. H. FILICINUM. *Dill.*

Marshes in glens and upland districts—frequent, but seldom fruiting. "Near head of Glenariff, but rare."—Moore, Herb. Coll. Sc. Dublin. Slieve

Gallion and Carndaisy (Derry); Agnew's Hill, Woodburn, Belfast Hills (Antrim); Holywood Hill (Down).—S.A.S. 2-5.

25. HYPNUM COMMUTATUM. *Dill.*

Bogs, marshes, and wet rocks. Abundant from Slieve Gallion to Slieve Donard. 4-5. Some of my specimens have been named as the var. *condensatum*, = *H. falcatum*—Bridel, but I am not able to distinguish the forms sufficiently.

26. H. UNCINATUM. *Hedw.*

Wet rocks, and damp stony ground in hilly districts—not infrequent. Slieve Gallion (Derry); Woodburn, Black Mountain, Colin Glen (Antrim); lower slopes of Slieve Donard (Down).—S.A.S. 4-6.

27. H. REVOLVENS. *Swartz.*

Peaty and marshy places—rather rare. Wet stony heath, Carrickfergus Commons; peaty marsh, Cave Hill; Slemish Mountain (Antrim); Slieve Croob (Down).—S.A.S. 5-6.

28. H. LYCOPODIODES. *Neck.*

"Fruiting in a bog, parish of Rasharkin, Co. Antrim, 1835."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

29. H. ADUNCUM. *Linn.* H. exannulatum. *Gumb.*

Boggy heaths—rare. "Bogs near Ballycastle, and other places in the Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. Boggy banks of stream on Black Mountain, near Belfast.—S.A.S.

30. H. STELLATUM. *Dill.*

"On bogs in the moors above Carnlough (Antrim); barren."—Moore, Herb. Coll. Sc. Dublin.

31. H. IRRIGUUM. *Wils.*

Rare. On stones in stream at Magheramorne (Antrim).—S.A.S.

32. H. SERPENS. *Dill.*

On trees, stones, and hedge banks—frequent. "Abundant everywhere through Ireland."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. Moneymore, Toome (Derry); shores of Lough Neagh, Kilroot, Knockagh, &c. (Antrim); Sydenham, Castlereagh Hills (Down).—S.A.S. 2-5.

33. HYPNUM UNDULATUM. *Dill.*

On mountain heaths—not infrequent. "On moist banks in the northern glens—frequent."—Moore, Herb. Coll. Sc. Dublin. Slieve Gallion, and Sperrin Mountains (Derry); Agnew's Hill (Antrim); Slieve Donard (Down), at 1,800 feet.—S.A.S. An elegant moss that only occurs in small quantity. I have not met with it in fruit.

34. H. SYLVATICUM. *Dill.*

Rocks and banks—rare. Near Lisburn—Mr. J. Creeth. Crevices of basaltic rocks, Knockagh; in fruit on Black Mountain, 4th July, 1864 (Antrim); ditch bank, Castlereagh Hill (Down).—S.A.S.

35. H. ELEGANS. *Hook.*

Very rare. Among loose stones, Slieve Donard (Down); barren.—S.A.S.

36. H. DENTICULATUM. *Dill.*

Not common. "Frequent in shady crevices of rocks, as at Ballygally Head."—Moore, Herb. Coll. Sc. Dublin. On rocks at Slemish Mountain (Antrim).—S.A.S.

37. H. PULCHELLUM. *Dicks.*

"Abundant in shady crevices of rocks at Sallagh Braes and Agnew's Hill."—Moore, Herb. Coll. Sc. Dublin.

38. H. ALOPECURUM. *Dill.* (Thamnium.)

Damp woods and shady banks of streams—abundant and luxuriant. Derry, Antrim, Down. 10-2.

39. H. RUSCIFOLIUM. *Dill.*

On stones in streams, throughout Derry, Antrim, Down. 9-2.

40. H. MURALE. *Dill.*

"Tops of walls, and on stones near Ballycastle."—Moore, Herb. Coll. Sc. Dublin.

41. H. CONFERTUM. *Dicks.*

On damp shady banks, on stones, and on trees, occasionally on walls—common. 11-2.

42. H. TEESDALII. *Sm.*

Very rare. Found in 1859 by Mr. J. H. Davies, in Colin Glen, near Belfast. This, which is amongst the rarest Irish mosses, occurs on wet rocks

by the side of the stream in the upper glen: I find it also on wet rocks in Redhall Glen, near Ballycarry (Antrim).—S.A.S. 4-6.

43. HYPNUM TENELLUM. *Dicks.*

On limestone and basaltic rocks—not common. "Abundant on shady rocks and stones."—Moore, Herb. Coll. Sc. Dublin. In crevices of wet basaltic rocks, Sallagh Braes; on chalk rocks, Redhall Glen, Carr's Glen, Cave Hill (Antrim).—S.A.S. 1-4.

44. H. SWARTZII. *Turner.*

There is a specimen in Dr. Moore's Antrim Mosses in the Herb. Coll. Sc., but no locality is given. Woodburn Glen, Colin Glen (Antrim).—S.A.S.

H. flagellare should be found, it occurs at Pomeroy, in the neighbouring county of Tyrone.

45. H. PUMILUM. *Wils.*

"Antrim, Templeton in Herb. Turner."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

46. H. PRŒLONGUM. *Dill.*

On stones and banks, and at roots of trees in damp shady places—common in Derry, Antrim, and Down. 10-2.

H. Stokesii, Turner, *which is now considered as only a form of the preceding, occurs in woods in several localities.*

47. H. PILIFERUM. *Vaill.*

Damp rocky banks in glens—frequent. "Occurs with fruit near Belfast."—Templeton, Flora Hibernica. Glynn near Larne, Glenoe, Woodburn, Carr's Glen near Belfast (Antrim); Banbridge, Newtownards Glen (Down).—S.A.S. Fruit very rare.

48. H. MYOSUROIDES. *Linn.*

At roots of trees, and on stones in damp places—not rare. "Frequent in Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. Carndaisy Glen (Derry); Kilwaughter, Woodburn, Knockagh (Antrim); Portavo Wood (Down).—S.A.S. 11-2.

49. H. STRIATUM. *Hedw.*

Woods, shady banks, and sometimes on trees—common. "Shady banks and woods through the Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. Moneymore (Derry); Glynn, Woodburn, Colin Glen, Derriaghy (Antrim); Ballylesson, Banbridge, Ballynahinch (Down).—S.A.S. 11-2.

50. HYPNUM PLUMOSUM. *Swartz.*

Frequent on wet rocks, and on stones in mountain streams. "On moist stones and banks in Co. Antrim—not rare."—Moore, Herb. Coll. Sc. Dublin. Moneymore (Derry); Agnew's Hill, Woodburn, Belfast Hills, Colin Glen (Antrim); Ballyoran, Slieve Croob (Down).—S.A.S. 10-2.

51. H. POPULEUM. *Hedw.*

Frequent on stones, more rarely on trees. Sallagh Braes near Larne, Kilroot, Woodburn, Knockagh, Carnmoney Hill, Belfast Hills (Antrim); hills near Holywood and Newtownards (Down).—S.A.S. 11-2.

52. H. RUTABULUM. *Linn.*

Damp banks, on stones, on the ground, and sometimes on walls and trees—abundant everywhere. 10-3.

53. H. VELUTINUM. *Linn.*

On stones, hedge banks, walls, and sometimes on trees—common in Derry, Antrim, and Down. 11-2.

54. H. ALBICANS. *Dill.*

"Glenarm, and through the county of Antrim."—Moore, Herb. Coll. Sc. Dublin. This moss occurs on sandy shores all round the Down coast, but always barren.—S.A.S.

55. H. GLAREOSUM. *Bruch.*

"On a moist meadow in Glenaan, Co. Antrim, but rare."—Moore, Herb. Coll. Sc. Dublin. On ditch bank west of Carrick Junction Station (Antrim); barren.—S.A.S. Probably not rare, but easily overlooked.

56. H. LUTESCENS. *Dill.*

Rare. "Moist boggy places in Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. In old chalk quarry at Springhill, Moneymore (Derry); in fruit Dec. 26, 1872.—S.A.S.

57. H. TAMARISCINUM. *Hedw.*

In shady glens, and on damp banks in woods and hedges—very common. 11-12.

58. LESKEA SERICEA. *Dill.*

On rocks, stones, trees, walls, and dry banks—frequent through Derry, Antrim, and Down. 11-2.

59. CLIMACIUM DENDROIDES. *Web. and Mohr.*

Wet mountain pastures, marshy meadows, and lake shores—frequent in Derry, Antrim, and Down. A species easily recognised, but I have not found it in fruit.

60. ISOTHECIUM MYURUM. *Dill.*

On rocks, stones, trees, and banks in woods and glens—common in Derry, Antrim, and Down. 11-1.

61. PTEROGONIUM GRACILE. *Swartz.*

Rare. In some quantity on trap rocks near summit of Ballygally Head (Antrim).—S.A.S.

62. P. FILIFORME. *Hedw.*

"On rocks near Ballygally Head, and other places in Co. Antrim."—Moore, Herb. Coll. Sc. Dublin.

63. ANOMODON VITICULOSUS. *Hook. and Tayl.*

On chalk and basalt rocks—not uncommon. "Frequent on limestone rocks; in fruit at Ballygally Head, Feb., 1837."—Moore, Herb. Coll. Sc. Dublin. Abundant in several localities in Co. Antrim, but I have not found it in fruit.—S.A.S.

64. ANTITRICHIA CURTIPENDULA. *Bridel.*

Rare. "Summit of Colin Mountain, Belfast range."—Mr. J. H. Davies, Phytologist, New Series, Vol. III.

65. ANÆCTANGIUM COMPACTUM. *Schwaeg.*

"Frequent in northern glens, Carnlough, June, 1838."—Moore, Herb. Coll. Sc. Dublin.

66. FISSIDENS TAXIFOLIUS. *Hedw.*

Wet banks in woods and glens, and crevices of rocks—frequent. Larne, Belfast Hills (Antrim); Holywood Hills, Slieve Croob (Down).—S.A.S. 11-2.

67. F. ADIANTOIDES. *Hedw.*

Damp shady rocks, wet heaths and banks, sometimes in bogs—rather frequent. "Glenariff, Cushendall, &c."—Moore, Herb. Coll. Sc. Dublin. Moneymore (Derry); Sallagh Braes, Agnew's Hill, Kilwaughter, Belfast Hills, Colin Glen (Antrim); Cregagh Glen, Drumbo Glen (Down).—S.A.S. Fruit scarce. 12-4.

68. FISSIDENS BRYOIDES. *Hedw.*

Sides of streams, and shady hedge banks—very common. 11-3.

69. F. INCURVIS. *Schwaeg. non Br. and Schimp.*

Very rare. In some plenty on a fallen mass of greensand rock on Black Mountain, near Whiterock, west of Belfast. On damp chalk rocks in Redhall Glen, near Ballycarry (Antrim).—S.A.S. The specimens are in good fruit, and this very minute moss may possibly prove to be the *F. pusillus*, Wils., of which I have not seen any specimens. Not found elsewhere in Ireland.

70. TAYLORIA SERRATA. *Br. and Schimp.*

Very rare. On the 13th July, 1868, I met with one patch of this rare and interesting moss growing on cow-dung in boggy ground near the summit of Benbradagh Mountain, above Dungiven, Co. Derry. The moss was at that time only commencing to fruit, but one stem having a mature capsule. The only Irish station.

71. TETRAPLODON MNIOIDES. *Br. and Schimp.*

Marshy ground on mountains—rare. On the summits of Slieve Donard and Slieve Bingian in the Mourne range (Down).—S.A.S. 6-7.

72. SPLACHNUM SPHÆRICUM. *Hedw.*

On decomposing cow-dung on mountain bogs—not rare. Benbradagh (Derry); wet heath above Carnlough, Cave Hill, Black Mountain (Antrim); abundant on Slieve Croob (Down).—S.A.S. 6-7.

73. S. AMPULLACEUM. *Linn.*

Occupies similar habitats, but is less frequent than No. 72. "Rasharkin and Glenravel."—Moore, Herb. Coll. Sc. Dublin. Knockagh and Cave Hill (Antrim). —S.A.S. 5-6.

74. BARTRAMIA ITHYPHYLLA. *Bridel.*

Dry rocks—rare. "Rocks above Carrickfergus."—Moore, Herb. Coll. Sc. Dublin. Basaltic cliffs, Knockagh; on basalt, Black Mountain (Antrim). —S.A.S.

75. B. ŒDERI. *Gunner.*

Rare. "Deer Park, Glenarm; Colin Glen."—Moore, Herb. Coll. Sc. Dublin.

76. B. HALLERIANA. *Hedw.*

Rare. "At Colin Glen, near Belfast."—Flor. Hib. "At Colin Glen, near the top."—Moore, Herb. Coll. Sc. Dublin.

77. BARTRAMIA POMIFORMIS. *Hedw.*

Sandy banks and dry rocks—not rare. "Frequent in the glens of Antrim."—Moore, Herb. Coll, Sc. Dublin. Slemish Mountain, Woodburn Glen (Antrim); Ballylesson, abundant and fine in Drumbo Glen, in crevices of granite rocks on Slieve Donard (Down).—S.A.S. 4-5.

78. B. CALCAREA. *Br. and Schimp.*

Not common. Damp places, Belfast Hills (Antrim); marshy margin of stream at upper end of Holywood Glen (Down).—S.A.S. 7-8.

79. B. FONTANA. *Bridel.*

Wet places in hilly districts—common from the Sperrin range in Tyrone and Derry, to the Mourne Mountains in Down. 6-7.

80. B. ARCUATA. *Bridel.*

Common among heath on mountains and hills through Derry, Antrim, and Down; found in fruit by Dr. Moore near Carrickfergus. I have not met with it in that state.

81. PHYSCOMITRIUM PYRIFORME. *Br. and Schimp.*

Marshy ground, and furrows of sandy and gravelly fields—not uncommon. "Glenariff."—Moore, Herb. Coll. Sc. Dublin. The Plains, and Ormeau Park, Belfast; Kilroot, Loughmourne, Black Mountain, Lisburn (Antrim); Portavo, Dromore (Down).—S.A.S. 4-6.

82. P. FASCICULARE. *Br. and Schimp.*

Damp pasture fields on clay and gravel—scarce. "Giant's Causeway, The Glens, and near Belfast."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. Whitehead, Kilroot (Antrim); Ballymachan, Sydenham (Down).—S.A.S. 4-6.

83. ENTOSTHODON TEMPLETONI. *Schwaeg.*

"Abundant by the sides of rivers in northern glens."—Moore, Herb. Coll. Sc. Dublin. Not common in the southern part of the Co. Antrim; I have not yet met with it.—S.A.S.

84. FUNARIA HYGROMETRICA. *Hedw.*

On walls, waste ground, and dry heaths. This cosmopolitan moss is in profusion everywhere throughout the district. 2-7.

VAR. B. PATULA. On wall, Castlereagh Hill (Down).—S.A.S.

85. FUNARIA MUHLENBERGII. *Schwaeg.*

"On limestone soil, Deer Park, Cave Hill, Belfast."—Moore, Herb. Coll. Sc. Dublin.

86. AMBLYODON DEALBATUS. *Beauv.*

"Mountains in the North of Ireland."—Templeton, Flor. Hib. "On a flow-bog in the parish of Rasharkin, 1837."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

87. MNIUM SUBGLOBOSUM. *Br. and Schimp.*

Wet peat bogs—rare. Carrickfergus Commons, and margin of Lough Mourne in the same locality, Cave Hill (Antrim).—S.A.S. 2-4. Not known elsewhere in Ireland. This moss must be sought, at the expense of damp feet, in the wettest parts of the bog, where it fruits, but not abundantly, under tufts of sedge and coarse grass.

88. M. PUNCTATUM. *Hedw.*

River banks, and wet rocks in mountainous districts—frequent. Slemish, Sallagh Braes, Belfast Hills (Antrim); Mourne Mountains (Down).—S.A.S. Very luxuriant specimens are found. 11-5.

89. M. UNDULATUM. *Hedw.*

Shady banks near streams, and in glens—frequent from Slieve Gallion to Slieve Donard, but not usually abundant. The only occasion on which I found this moss in fruit was in Feb., 1866.

90. M. HORNUM. *Linn.*

On shady hedge-banks, and in woods—common, and very large. 3-5.

91. M. ROSTRATUM. *Schwaeg.*

On wet rocks and stones near streams—not common. Colin Glen, and other glens in the Belfast Hills.—S.A.S. An elegant moss, and fruiting abundantly. 3-5.

92. BRYUM ROSEUM. *Schreb.*

Very rare. "On dry rocks in the Little Deer Park, Glenarm; barren. —Moore, Herb. Coll. Sc. Dublin.

93. B. ZIERII. *Dicks.*

Mountains—very rare. "Clontygearagh, near Cushendun, Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. Very sparingly on basaltic cliffs at Sallagh Braes, near Larne (Antrim).—S.A.S. My specimens are barren.

94. BRYUM ARGENTEUM. *Linn.*

On walls, roofs of houses, roadsides, and waste ground—very common, and may be found in fruit nearly the whole year round.

VAR. C. LANATUM.

This form seems to prevail here. I have specimens from several localities that answer the description.

95. B. JULACEUM. *Sm.*

"Abundant in Glendun; in fruit July, 1836."—Moore, Herb. Coll. Sc. Dublin.

96. B. ERYTHROCARPON. *Bridel. non Schwaeg.* B. atropurpureum. *Web. and Mohr.*

On walls, waste ground, and quarry heaps—frequent. Cave Hill Quarries, and several places near Belfast, and Lisburn (Antrim); 'Newtownards, Millisle, Dundrum (Down).—S.A.S. 4-7.

97. B. SANGUINEUM. *Ludw.* B. erythrocarpon. *Schwaeg.*

Walls—not common. Very fine and abundant on old wall between Donaghadee and Millisle (Down).—S.A.S. In fruit 25th April, 1874.

98. B. CÆSPITICIUM. *Linn.*

Belfast Hills, and common in many places, but not nearly so abundant as its near ally No. 99.

99. B. CAPILLARE. *Hedw.*

On walls, trees, rocks, and dry banks—very common. 1-6.

100. B. INTERMEDIUM. *Bridel.*

Gravelly shores of Lough Neagh (Antrim); and gravel bank at Ballymachan (Down); near Belfast.

101. B. INCLINATUM. *Br. and Schimp.*

People's Park, Belfast.

102. B. CERNUUM. *Hedw.*

On walls—not uncommon. Toome (Derry); near Lisburn (Antrim). The distribution of this, and the two preceding species, is imperfectly known.

103. BRYUM PALLENS. *Swartz.*

Banks of streams, and in boggy places—not common. "Banks of stream above Colin Glen."—Mr. J. H. Davies, Phytologist, Vol. III. Sluggada Burn at Dart Mountain (Derry); not rare in the same range, rising to 1,400 feet. Wet bog at Duneane, near Randalstown (Antrim).—S.A.S. 6-7.

104. B. ALPINUM. *Linn.*

Mountain heaths—frequent. Slieve Gallion (Derry); Slemish, Agnew's Hill, Divis Mountain (Antrim); descending to near the sea level on Slieve Donard (Down).—S.A.S. All barren. Dr. Moore found it in fruit on Carrickfergus Commons in June, 1836.

105. B. PSEUDO-TRIQUETRUM. *Schwaeg.*

Wet rocky places, and banks of streams in the hills—rare. On Slemish Mountain, and on wet basaltic rocks in Colin Glen (Antrim); on slate rocks in Newtownards Glen, old quarry at Ballymachan, wet rocks on Slieve Donard (Down).—S.A.S. 5-7.

106. B. WAHLENBERGII. *Schwaeg.*

Dripping rocks and wet stony places—not common. "The Glens near Cushendall."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. Prospect Hill, Lisburn.—Mr. J. Creeth. Crow Glen near Belfast (Antrim); Ballymachan, Banbridge (Down).—S.A.S. 4-5.

107. B. CARNEUM. *Linn.*

Sides of drains and streams, and on rocky river banks—not rare. "Banks of small rivulet at Ballintoy."—Moore, Herb. Coll. Sc. Dublin. Woodburn, Belfast Hills, Lisburn (Antrim); Ballymachan Glen (Down).—S.A.S. 3-5.

108. B. NUTANS. *Schreb.*

Bogs and wet heaths—frequent. "Slemish."—Moore, Herb. Coll. Sc. Dublin. Woodburn, Belfast Hills, Lisburn (Antrim); rising to 1,600 feet on Slieve Croob, and to over 2,000 on Slieve Donard (Down).—S.A.S. 4-5.

109. B. CRUDUM. *Schreb.*

"On a flow bog, in the parish of Rasharkin, Antrim, 1837."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. "Carnlough Glen near the Waterfall."—Moore, Herb. Coll. Sc. Dublin.

110. AULACOMNION PALUSTRE. *Schwaeg.*

Marshy heaths and wet peat bogs—frequent. Slieve Gallion (Derry);

shores of Lough Neagh, Duneane near Randalstown, Slemish, Tardree, Sallagh Braes, Carrickfergus Commons, King's Moss, Belfast Hills (Antrim); Moneyreagh, Conlig, Slieve Croob (Down).—S.A.S. 5-6.

111. POLITRICHUM PILIFERUM. *Schreb.*

Dry turfy banks—common from the Derry and Tyrone Mountains to the Mourne range in Down; rising to 2,000 feet. 4-6.

112. P. JUNIPERINUM. *Hedw.*

"Frequent on banks in northern glens."—Moore, Herb. Coll. Sc. Dublin. Near Lisburn (Antrim).—Mr. J. Creeth. Ballygally Head (Antrim); near Banbridge (Down).—S.A.S.

113. P. COMMUNE. *Linn.*

On heaths and bogs—common everywhere. Rising to summit of Slieve Donard (Down) 2,796 feet. 4-6.

114. P. GRACILE. *Menzies.*

"Turf bogs—common in Ireland."—Moore, Proc. R. I. Acad., Series II., Vol I., No. 8. Tardree (Antrim); Conlig (Down).—S.A.S. I have also met with this moss at Tartaraghan, Co. Armagh; probably passed by as a small form of *P. commune*, which it resembles.

115. POGANATUM ALPINUM. *Bridel.*

Heaths and bogs—frequent. "Slemish."—Moore, Herb. Coll. Sc. Dublin. Abundant on the Sperrin Mountains in Derry and Tyrone; bogs at Toome (Derry); Knockagh, Belfast Hills (Antrim). 5-7.

116. P. URNIGERUM. *Bridel.*

Heaths, and sandy and gravelly banks—frequent. "Banks in Glendun, and other places in Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. Near Lisburn.—Mr. J. Creeth. Knocklayd, Whitehead, Belfast Hills (Antrim); Castlereagh Hill, Slieve Croob, Slieve Donard (Down).—S.A.S. 12-2.

117. P. ALOIDES. *Bridel.*

Dry shady banks, especially in heathy places—common in Derry, Antrim, and Down. 10-3.

118. P. NANUM. *Bridel, non Weiss.*

Sandy and gravelly banks, and dry heaths—frequent. Old quarry, Castledawson (Derry); Sallagh Braes, Slieve True, Black Mountain, Derriaghy,

Newforge (Antrim); Sydenham, Castlereagh Hill, Slieve Donard, Banbridge (Down).—S.A.S. The variety *longisetum* occurs in the People's Park, Belfast; it prevails most, however, on mountain heaths—the typical form on sandy banks. Small forms of the preceding are sometimes taken for this species.

119. AVTRICHUM UNDULATUM. *Beaur.*

Woods and shady banks—common everywhere. 11-2.

120. TETRADONTIUM BROWNIANUM. *Schwaeg.*

"In a glen near Ballycastle; in fine fruit July, 1835."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. "Glenmakerron, Ballyvally, June, 1836."—Moore, Herb. Coll. Sc. Dublin.

121. TETRAPHIS PELLUCIDA. *Hedw.*

Very rare. "Glenariff, Co. Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

122. ZYGODON CONOIDEUS. *Dicks.*

"On trees, Orange Grove, near Belfast, Templeton."—Flor. Hib. "Rare, only observed on trees in Glenarm Deer Park."—Moore, Herb. Coll. Sc. Dublin.

123. Z. RUPESTRIS. *Schimp.* Z. Stirtoni. *Schimp, MS.* = Z. viridissimus, Var. B. rupestris.

Very rare. This interesting addition to the Irish moss-flora was found by me on basaltic rocks, by the stream in the little glen at Glenoe, between Carrickfergus and Larne. The tuft was in good fruit in Feb., 1875. I also found it in the barren state in crevices of rocks on the shore at Portavo, Co. Down. I am indebted to Mr. Hobkirk, who pointed out to me that my moss was not *Z. viridissimus*, as I then thought.

124. Z. MOUGEOTTII. *Br. and Schimp.*

Rare. "A solitary stem with fruit was found near the head of Glenballyeman, Cushendall, in June, 1863."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. "Colin Glen."—Mr. J. H. Davies, Phyto., N.S., Vol. III.

125. ORTHOTRICHUM PHYLLANTHUM. *Br. and Schimp.*

On trees, and occasionally on stones and rocks—very common, but always barren.

126. ORTHOTRICHUM DRUMMONDII. *Hook. and Grev.*

On trees—very rare. In Dec., 1869, I found in Colin Glen, near Belfast, one small tuft that seems without doubt to belong to this species, though the capsules were far advanced.

127. O. BRUCHII. *Bridel.*

On trees—not common. "Colin Glen, sparingly."—Mr. J. H. Davies, Phytologist, N. S., Vol. III. Near Ballycastle, on bushes plentifully in little glen near Glenoe (Antrim).—S.A.S.

128. O. CRISPUM. *Hedw.*

Abundant on trees and bushes throughout the district. 6-11.

129. O. SAXATILE. *Bridel.* O. anomalum. *Bryol. Brit.*

On limestone, basalt, and other rocks—frequent, and usually in abundance. "Frequent on white limestone rocks in Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. Sperrin Mountains (Derry); Larne, Carrickfergus Commons, Belfast Hills (Antrim).—S.A.S. 3-5.

130. O. PULCHELLUM. *Sm.*

On trees and bushes—frequent, but not abundant. More commonly found in little tufts on branches of bushes that overhang streams. "On trees, Glenarm, and other places in Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. Near Lisburn.—Mr. J. Creeth. On beech trees growing on rath at Rookstown between Moneymore and Slieve Gallion (Derry); on blackthorn at Glenoe, on hazel bushes Cave Hill and Colin Glen (Antrim); on branches of Guelder rose Dundonald Glen (Down).—S.A.S. 2-5.

131. O. LEIOCARPUM. *Br. and Schimp.*

On trees—not common. "Glenarm Demesne, and near Ballycastle."—Moore, Herb. Coll. Sc. Dublin. On beech trees in planting at Drumcormick at foot of Slieve Gallion above Moneymore (Derry); Redhall Glen and Cave Hill (Antrim); Belvoir Park (Down).—S.A.S. 3-5.

132. O. DIAPHANUM. *Schrad.*

On trees, and on stones—common. Blackhead, Kilroot, Whitehouse, Colin Glen (Antrim); Moira, Drumbo Glen, Newtownbreda (Down).—S.A.S. 1-5.

133. O. LYELLII. *Hook. and Tayl.*

On trees—not common. Glenarm Park; near the Lagan at Shaw's Bridge (Antrim); Belvoir Park and Banbridge (Down); all barren.—S.A.S.

134. ORTHOTRICHUM RUPESTRE. *Schleich.*

Rare. "On basaltic rocks near the Giant's Causeway, 1837; Fairhead, Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

135. O. AFFINE. *Schrad.*

On trees, and sometimes on stones—very common throughout the district. 3-6.

136. O. STURMII. *Hop. and Hornsch.*

Rare. "Fairhead, Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

137. O. CUPULATUM. *Hoffm.*

On rocks, but more often on stones in streams—not rare, abundant where it occurs. "On rocks at Fairhead."—Moore, Herb. Coll. Sc. Dublin. Glynn near Larne, Kilroot, Glenoe, North Woodburn stream, in a little stream near Trench House The Falls (Antrim).—S.A.S. 1-5. A fine moss, with glabrous inflated veil, and large nearly globular sporangium: all the specimens I have met with belong to the var. *nudum*, and are very different in aspect from what we expect from descriptions of this species.

138. PTYCHOMITRIUM POLYPHYLLUM. *Br. and Schimp.*

On rocks and stones in hilly districts, and sometimes on bushes—very abundant from the Derry mountains to the Mourne range. 11-4.

139. GLYPHOMITRIUM DAVIESII. *Schwaeg.*

On basaltic and granitic rocks—rare. "On rocks at Fairhead."—Flor. Hib. "On the basalt at Giant's Causeway, also at Fairhead and Rathlin Island, Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. Abundant at the "Grayman's Path" Fairhead; on trap rocks, Ballygalley Head (Antrim); on granite rocks, Slieve Donard (Down).—S.A.S.

140. RACOMITRIUM CANESCENS. *Bridel.*

Stony heaths, and sandhills—not uncommon. "Frequent on rocks through Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. Carrickfergus Commons, Woodburn, Belfast Hills (Antrim); stony heath, Newtownards; sandhills, Newcastle (Down).—S.A.S. 1-3.

141. R. LANUGINOSUM. *Bridel.*

Mountain heaths—common in Antrim, Derry, and Down. At 1,700 feet on Slieve Croob, and over 2,500 on Slieve Donard (Down). 11-4.

142. RACOMITRIUM HETEROSTICHUM. *Bridel.*

Rocks and stones on the hills—very common, from the mountains of Derry to those of Down. 11-3.

143. R. FASCICULARE. *Bridel.*

On rocks and stones in mountainous districts—common from Slieve Gallion (Derry), to Slieve Donard (Down). 11-3.

144 R. SUDETICUM. *Br. and Schimp.*

Rocks on mountains—rare. "Sparingly on Slemish."—Moore, Herb. Coll. Sc. Dublin. Abundant on granite rocks Slieve Donard, from 1,000 feet to the summit, on the carn at the top of Slieve Croob (Down).—S.A.S. 3-4.

145. R. ACICULARE. *Bridel.*

On wet rocks, and on stones in streams in hilly regions—common in Derry, Antrim, and Down. 11-4.

146. R. ELLIPTICUM. *Br. and Schimp.*

On rocks—rare. "On rocks at Fairhead."—Flor. Hib. "Abundant on Fairhead and Slemish."—Moore, Herb. Coll. Sc. Dublin. Meenard Mountain (Derry).—S.A.S. I find this species still intermixed at Fairhead with *G. Davisii*, as mentioned by Dr. Taylor in Flor. Hib. On Slemish it is in considerable abundance.

147. R. PATENS. *Bridel.*

Very rare. "In large tufts on Slemish Mountain; barren."—Moore, Herb. Coll. Sc. Dublin. I have seen it on Slemish, but not in fruit.—S.A.S.

148. GRIMMIA LEUCOPHEA. *Grev.*

Rare. "On trap rocks near the Giant's Causeway, Antrim; also, on a similar rock in the island of Rathlin, 1837."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

149. G. OVATA. *Web. and Mohr.*

Mountain rocks—very rare. In October, 1873, I found a few little tufts of this moss in fruit, on stones at the summit of Sallagh Braes, near Larne (Antrim); this is the only known instance of its occurrence in the North of Ireland.

150. GRIMMIA TRICHOPHYLLA. *Grev.*

Very rare. "On rocks at Fairhead, Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

151. G. FUNALIS. *Schwaeg.* G. spiralis. *Hook. and Tayl.*

On mountains—not uncommon. "Slemish, and Agnew's Hill."—Moore, Herb. Coll. Sc. Dublin. On trap rocks, Benbradagh (Derry); Slemish, Sallagh Braes (Antrim); on granite rocks, Slieve Donard (Down).—S.A.S. Abundant in all these places, but barren.

152. G. ROBUSTA. *Fergusson.*

Very rare. "Fairhead, Antrim, 1862."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

153. G. SCHULTZII. *Bridel.*

Mountain rocks—rare. "On the top of Fairhead, Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. In some plenty on detached blocks of granite, Slieve Donard (Down).—S.A.S. 3-4.

154. G. PULVINATA. *Sm.*

On rocks, walls, and stone dykes—very common at sea level, and on mountains. 11-4.

VAR. B. OBTUSA. With shorter capsules, and short blunt lid, is plentiful on basaltic cliffs at the Knockagh near Carrickfergus (Antrim).

155. G. MARITIMA. *Br. and Schimp.*

Abundant on maritime rocks all round our coast. 11-3.

156. G. APOCARPA. *Br. and Schimp.*

On rocks and stones in damp places; abundant and generally distributed in Derry, Antrim, and Down. 11-3.

VAR. C. RIVULARE. Frequent on stones in streams.

157. G. CONFERTA. *Br. and Schimp.*

On amygdaloidal trap—not rare near Belfast. "On rotten trap rocks near Belfast."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. Cave Hill, Knockagh, &c. (Antrim).—S.A.S. Our plant, which is the var. *incana*, approaches the preceding in characters; all the leaves are piliferous, with long hair points, giving the tufts a hoary aspect.

158. HEDWIGIUM IMBERBE. *Br. and Schimp.*

"Fairhead, Antrim, very fine, May, 1854."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. On trap rocks near summit of Ballygally Head (Antrim). - S.A.S.

159. HEDWIGIA CILIATA. *Hedw.*

Rocks and stones; abundant on the hills from Slieve Gallion (Derry) to the Mourne Mountains (Down); ascending to 1,600 feet. 3-5.

160. ENCALYPTA STREPTOCARPA. *Hedw.*

Rare. "Glenarm, and wall of Deer Park, Belfast."—Moore, Herb. Coll. Sc. Dublin. Wall near Castle Robin (Antrim).—Mr. J. Creeth. Not found in fruit.

161. E. CILIATA. *Hedw.*

In crevices of damp shady rocks—rare. "Benbradagh (Derry); Lurigethan, Agnew's Hill (Antrim)."—Moore, Herb. Coll. Sc. Dublin. In small quantity on basaltic cliffs, Sallagh Braes (Antrim).—S.A.S. 7-9.

162. E. VULGARIS. *Hedw.*

"Lurigethan—rare."—Moore, Herb. Coll. Sc. Dublin.

163. CINCLIDOTUS FONTINALOIDES. *Beauv.*

On stones in streams and lakes—frequent. "Common in Antrim."—Moore, Herb. Coll. Sc. Dublin. Shores of Lough Neagh, Bushmills, Glenarm, Glynn, Kilroot, Woodburn, Six-mile Water, Colin Glen (Antrim); Newtownards Glen (Down).—S.A.S.

164. TORTULA TORTUOSA. *Hedw.*

In dense swollen tufts, on rocks in shady places—frequent, most abundant on basalt. Slemish, Sallagh Braes, Knockagh, Belfast Hills (Antrim); Newtownards Glen, and on granite cliffs Slieve Donard (Down).—S.A.S. Barren.

165. T. SUBULATA. *Bridel.*

Dry banks, especially sand. Common in Derry, Antrim, and Down.

166. T. LATIFOLIA. *Br. and Schimp.*

At roots of trees in damp places—rare. Margin of the Lagan near Lisburn.—Mr. J. H. Davies. Sparingly on a willow tree in the Bog Meadows near Belfast.—S.A.S. Barren.

167. TORTULA INTERMEDIA. *Bridel.*

On rocks and stones—not rare. On trap rocks Blackhead, on trap and limestone Knockagh and Black Mountain, limestone at Waterloo near Larne (Antrim), intermixed with *T. lævipila.* On slate roofs in Ballywalter (Down).—S.A.S. 3-4.

168. T. LÆVIPILA. *Bridel.*

On trees and rocks, sometimes on walls—frequent. On limestone walls Moneymore, in fine fruit on sycamore tree at Magherafelt (Derry) November, 1874, on trees at Kilwaughter, on trap and limestone rocks Larne, Islandmagee, Black Mountain (Antrim); on trees at Purdysburn (Down).—S.A.S. 1-4.

169. T. RURALIS. *Dill.*

Sandy sea shores, roofs of houses, and sometimes on rocks—abundant in many places, but usually barren. Near Castle Robin, Lisburn.—Mr. J. Creeth. Sands at Red Bay (Antrim); on thatched roofs near Comber, Dromore, and Banbridge (Down); abundant on sandy shores and dunes all round the coast of Down.—S.A.S.

170. T. PRINCEPS. *De Notr.*

"Rare in Ireland; on the basaltic rocks in Deer Park, Glenarm."—Moore, Proc. R. I. Acad., Series II., Vol. I. No. 8.

171. T. FALLAX. *Hedw.*

Wet clay banks, old quarries, and sometimes on rocks—common. 12-3.

172. T. RIGIDULA. *Mitt.*

Rare. "Banks by the sea at Dunluce Castle."—Moore, Herb. Coll. Sc. Dublin." "The Glens, Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. Castle Robin, Lisburn (Antrim).—Mr. J. Creeth.

173. T. INSULANA. *De Notr.* T. vinealis, Var. *b.* flaccida. *Bryol. Brit.*

Wet places, and at roots of trees—rare. On stones in stream, Kilroot, in fruit, April, 1874; at root of tree, Derriaghy (Antrim); barren.—S.A.S.

174. T. VINEALIS. *Bridel.*

Rare. Near Lisburn.—Mr. J. H. Davies, Phytologist, N. S., Vol. III. Roadside, Derriaghy near Lisburn (Antrim); at base of Slieve Croob (Down).—S.A.S.

175. TORTULA HORNSCHUCHIANA. *Schultz.*

Very rare. "On the walls of the old castle at Carrickfergus, Co. Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. I have collected a moss growing on Carrick Castle, which seems to be this species, but I could find no fruit. Dr. Moore informs me that this moss was named *T. gracilis* by the late Dr. Taylor.

176. T. REVOLUTA. *Schwaeg.*

On walls—common. Carrickfergus, many places about Belfast, Derriaghy (Antrim); Donaghadee, Carrowdore (Down).—S.A.S. 4-5.

177. T. CONVOLUTA. *Hedw.*

Old walls and quarry debris—not uncommon, abundant where it occurs. Knockagh (Antrim); wall on Castlereagh Hill, quarry heaps Moira, in the greatest profusion on old walls near Legacurry, Hillsborough, walls Banbridge (Down).—S.A.S. 4-6.

178. T. UNGUICULATA. *Hedw.*

Clay banks, stone dykes, quarry heaps, and sometimes on walls—very common. 12-4.

179. T. MURALIS. *Timm.*

Walls and rocks—the commonest moss in the district. 1-5.

VAR. D. RUPESTRIS. A well marked form, and usually much larger—frequent on rocks in hilly districts.

180. T. LAMELLATA. *Lindb.* Pottia cavifolia, var. gracilis. *Bryol. Brit.*

In small quantity on ditch bank by roadside between Millisle and Ballywalter (Down).—S.A.S. In fruit, 2nd February, 1874.

181. T. ALOIDES. *Br. and Schimp.*

Clay banks and walls—not common. On trap debris near Blackhead and the Gobbins, ditch bank a little north of Trooper's Lane Station (Antrim); wall of bridge close to Dundonald Station, wall Ballylesson, clay bank near Drum Bridge, stone dyke People's Park, clay bank on roadside near Groomsport (Down).—S.A.S. 9-1.

182. T. AMBIGUA. *Wils.*

Debris of rocks, and sometimes on ditch banks. Squire's Hill.—Mr. H. Knight. Limestone debris, Whitewell; on new red sandstone, Derriaghy (An-

trim); ditch bank at foot of Scrabo Hill, Castlereagh Hill (Down).—S.A.S. 10-1.

183. TORTULA STELLATA. *Schreb.* T. rigida. *Shultz.*

"In Colin Glen, a little above the new bridge, April, 1838."—Moore, Herb. Coll. Sc. Dublin.

Tortula papillosa. Wils. Mr. J. H. Davies, of Glenmore, believes that he found this species on trees near Lisburn; but inasmuch as he has not preserved any specimens, it had better remain over for confirmation.

184. TRICHOSTOMUM CRISPULUM. *Bruch.*

On rocks—rare. "Sparingly at Black Cave near Larne."—Moore, Herb. Coll. Sc. Dublin. In small quantity on stone dyke at Sallagh Braes (Antrim). In fruit, October, 1874,—S.A.S.

185. T. BRACHYDONTIUM. *Bruch.* T. mutabile. *Br. and Schimp.*

"It occurs in considerable abundance on the basaltic rocks of Antrim, but generally barren."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

186. T. TOPHACEUM. *Bridel.*

Wet rocks and boggy heaths—not rare. "Moist banks near Dunluce, &c." —Moore, Herb. Coll. Sc. Dublin. "The Glens, Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. Bog on Benbradagh Mountain (Derry); rocks in stream Glenariff, wet rocks near Glynn, and at Woodburn Glen (Antrim); wet rocks Bangor (Down).—S.A.S. 12-4.

187. T. TORTILE. *Schrad.* Ditrichum pusillum. *Timm.*

"Near Belfast. Templeton, afterwards Drummond."—Flor. Hib. "In the late Mr. Templeton's garden, Cranmore, Belfast, 1837."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

188. T. HOMOMALLUM. *Br. and Schimp.*

Rare. Abundant and in fine fruit on decomposing granite by side Sluggada stream near Dart Mountain (Derry), July, 1869.—S.A.S.

189. DIDYMODON CYLINDRICUS. *Br. and Schimp.*

Shady and moist rocks—not uncommon. Sallagh Braes, Woodburn, Knockagh, Belfast Hills (Antrim); Dundonald Glen, Holywood Glen (Down). —S.A.S. 9-12.

190. DIDYMODON RUBELLUS. *Br. and Schimp.*

On walls, quarry heaps, and waste ground—very common in Antrim and Down. 10-2.

191. POTTIA STARKEANA. *Nees and Hornsch.*

Sandy and gravelly fields—not rare. Sydenham, Holywood, Crawfordsburn, Groomsport (Down).—S.A.S. I have not seen any peristome on our plant.

192. P. HEIMII. *Br. and Schimp.*

Not rare. Abundant in wet places, and on rocks at, or just above, high-water mark near Bangor, and several other places on the shores of Belfast Bay.—S.A.S. 4-5.

193. P. LITTORALIS. *Mitt.*

Very rare. Sparingly on ditch bank by roadside between Millisle and Ballywalter (Down).—S.A.S. I collected the specimens as *P. Wilsoni.* Mr. Hobkirk has, however, pointed out that they really belong to Mr. Mitten's *P. littoralis.* Not before recognised as Irish.

194. P. TRUNCATULA. *Linn.*

On damp ground, also on ditch banks and roadsides—very common throughout the district. 10-2.

195. CAMPYLOPUS PYRIFORMIS. *Bridel.* C. TORFACEOUS. *Br. and Schimp.*

Bogs and wet heaths—not rare. Bog on Benbradagh (Derry); Divis Mountain near Belfast (Antrim); rocky and heathy shore near Groomsport (Down).—S.A.S. Fruiting in the two former localities. 3-7.

196. C. FRAGILIS. *Br. and Schimp.*

On peaty banks and grassy heaths—frequent. In fine fruit on Agnew's Hill near Larne, also fruiting on Slieve True near Carrickfergus (Antrim); Conlig and Slieve Croob (Down).—S.A.S. 12-4.

VAR. B. DENSUS. Very frequent on mountains and in glens all through the district. I have not, however, seen it in fruit.

197. C. FLEXUOSUS. *Bridel.*

Rare. "Fairhead, Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. I have only met with specimens on Benbradagh Mountain (Derry), and Slemish (Antrim).—S.A.S. 5-7.

198. CAMPYLOPUS ALPINUS. *Schimp.*

"Cushendall, Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

199. CERATODON CYLINDRICUS. *Br. and Schimp.*

Said to have been found near the Botanic Gardens, Belfast. I have not seen a specimen, nor do I know if any Irish specimens are in existence.

200. C. PURPUREUS. *Bridel.*

On waste ground, walls, banks, sandhills, and dry heaths—everywhere abundant. 3-5.

201. LEUCOBRYUM GLAUCUM. *Hampe.*

On heaths—not uncommon. "In bogs on the mountains—not rare in Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. Black Mountain and Mount Aughrim (Antrim).—Mr. J. Creeth. Conlig, Slieve Donard (Down).—S.A.S. Barren.

202. DICRANUM BONJEANII. *De Notr.* D. palustre. *Bridel.*

Rare. In the Archbishop's Wood, Portglenone."—Moore, Herb. Coll. Sc. Dublin. Near Lisburn.—Mr. J. Creeth.

203. D. MAJUS. *Turn.*

On damp banks in woods and heaths – frequent, but rare in fruit. Coming into fruit abundantly in Carndaisy Glen near Moneymore (Derry), 23rd Nov., 1874; Belfast Hills (Antrim); Holywood Hills (Down).—S.A.S.

204. D. SCOPARIUM. *Hedw.*

Shady places amongst heath on the hills, and on damp banks in woods and glens—very common. Fruiting, more or less, at nearly all seasons.

205. D. HETEROMALLUM. *Hedw.*

In woods and glens, sometimes on heaths and rocks—frequent. Lisburn.—Mr. J. Creeth. Fairhead, Larne, Cave Hill (Antrim); Knock, Portavo, Slieve Croob—abundant near summit Slieve Donard (Down), at 1,800 feet.—S.A.S. 10-3.

206. D. SUBULATUM. *Hedw.*

"Sides of Maryburn rivulet near Belfast, Templeton."—Flor. Hib. "In Glenariff, sparingly."—Moore, Herb. Coll. Sc. Dublin.

207. DICRANUM VARIUM. *Hedw.*

Ditch banks, under trees in woods, and on damp clay ground—very common. 11-3.

208. D. CERVICULATUM. *Schimp.*

In turf bogs—not common. "Only observed in a bog near Bruce's Castle, Rathlin."—Moore, Herb. Coll. Sc. Dublin. King's Moss between Belfast and Ballyclare (Antrim); Moneyreagh (Down). I also found this moss at Tartaraghan in the adjoining Co. of Armagh, and in Tyrone.—S.A.S. 6-7.

209. D. SQUAROSUM. *Schimp.*

On rocks by streams, and on wet stony heaths—rare. "Only observed in Glenariff."—Moore, Herb. Coll. Sc. Dublin. Rocky bank of stream, Meenard Mountain near Dungiven (Derry); Slemish Mountain, and heaths on Carrickfergus Commons (Antrim); on wet rocks Slieve Croob and Slieve Donard (Down). This latter is a remarkable and beautiful form, with stems three to four inches long, and very large loose leaf cells.—S.A.S. Barren as far as I have observed.

210. D. CRISPUM. *Schimp.*

Rare. "Near Belfast, Mr. Templeton."—Flor. Hib. On damp banks at Cregagh Glen on Castlereagh Hill (Down). The only locality where I have met this moss.—S.A.S.

211. D. PELLUCIDUM. *Hedw.*

Rocky banks of streams—frequent. "Larne, Templeton."—Flor. Hib. Glynn, Cave Hill, Colin Glen, and Crow Glen, in Belfast Hills (Antrim); little glen near Dundonald Station, Castlereagh Glen (Down)—S.A.S. 12-3.

212. CYNODONTIUM BRUNTONI. *Br. and Schimp.*

"Rare—only in one place in the Little Deer Park, Glenarm, Antrim."—Moore, Herb. Coll. Sc. Dublin.

213. BLINDIA ACUTA. *Br. and Schimp.*

Rare. "Near Belfast, Templeton."—Flor. Hib. "On wet banks and near waterfalls in northern glens, and on Slemish."—Moore, Herb. Coll. Sc. Dublin. Wet stony heaths, Slieve Croob (Down)—sparingly.—S.A.S.

214. SELIGERIA CALCAREA. *Br. and Schimp.*

On chalk rocks—very rare. Occurs in small quantity on fragments of limestone at intervals for about half a mile along the eastern slope of Black Mountain,

Belfast. I have also found it along with the next species on damp chalk rocks in Colin Glen (Antrim). The only Irish stations.—S.A.S. 3-5.

215. SELIGERIA PUSILLA. *Br. and Schimp.*

In crevices and fissures of chalk rocks—rare. "Near Belfast, Templeton—very rare."—Flor. Hib. "Near Belfast at Wolfhill, above the mill, in considerable abundance on the white limestone rocks; fruiting May, 1837. Also on shady limestone rocks above Lisburn. This rare and pretty little moss appears to be confined in Ireland to the white limestone rocks of Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. "Limestone of Sallagh Braes; not unfrequent on limestone in Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. In small quantity in the Windy Gap in Crow Glen, on the eastern slopes of Black Mountain Belfast, near the lower waterfall Colin Glen (Antrim).—S.A.S. Fruiting at intervals from April till Oct. inclusive.

216. RHABDOWEISSIA FUGAX. *Br. and Schimp.*

Rare. "Sallagh Braes, Antrim; Benevenagh, Derry."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. "Slemish and Collon, rare."—Moore, Herb. Coll. Sc. Dublin.

217. WEISSIA VERTICILLATA. *Brid.*

Rare. Between Larne and Ballygally, occurring in dense tufts on chalk ocks near the Blackcove Tunnel (Antrim).—S.A.S.

218. W. CRISPULA. *Hedw.*

Very rare. "Shady rocks, Ballygally Head."—Moore, Herb. Coll. Sc. Dublin. Dr. Moore informs me that he collected the plant in the above locality in May, 1837; and that is believed to be the only station for it in Ireland.

219. W. CIRRHATA. *Hedw.*

"On wood of the locks of the Lagan Canal, May, 1838."—Moore, Herb. Coll. Sc. Dublin.

220. W. CONTROVERSA. *Hedw.*

On hedge banks, on the ground, and sometimes on rocks—very common everywhere. 12-4.

221. GYMNOSTOMUM MICROSTOMUM. *Hedw.*

Gravelly banks, waste ground, and fields—not at all common. Gravel bank Glenmachan, crevices of rocks on shore at Groomsport, and wet banks at same place, sandhills Newcastle (Down).—S.A.S. 2-6.

222. GYMNOSTOMUM CURVIROSTRUM. *Hedw.*

Rare. "Rocks at Fairhead, Mr. Templeton."—Flor. Hib. "Glen at Cushendall."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

223. G. RUPESTRE. *Schwæg.*

"Glens in Antrim—not rare."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

224. PHASCUM CRISPUM. *Hedw.*

"Banks near Belfast, Templeton."—Flor. Hib.

225. P. SUBULATUM. *Linn.*

In fields and on banks, especially where sandy or gravelly—frequent. Moneymore (Derry); Carnmoney Hill, White Mountain near Lisburn, Newforge (Antrim); Sydenham, Glenmachan, Castlereagh Hill, Mealough Hill (Down).—S.A.S. 2-4.

226. P. NITIDUM. *Hedw.*

"Banks near Belfast, Templeton."—Flor. Hib. "Rathlin, Aug., 1836."—Moore, Herb. Coll. Sc. Dublin.

227. P. PATENS. *Schimp.*

"On banks near Belfast, Templeton."—Flor. Hib.

228. P. CUSPIDATUM. *Schreb.*

"Hedge banks and sandy fields—not very common. Sydenham, Belmont, Giant's Ring (Down).—S.A.S. 1-3.

229. P. SERRATUM. *Schreb.*

"About Belfast—frequent, but rare elsewhere."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. "Rare—Rathlin, Aug., 1836."—Moore, Herb. Coll. Sc. Dublin.

230. SPHAGNUM SQUARROSUM. *Persoon.*

Bogs. "Not common in Antrim."—Moore, Herb. Coll. Sc. Dublin. In dense masses in wet bog near Moneyreagh (Down).—S.A.S. 6-7.

231. S. SUBSECUNDUM. *Nees and Hornsch.*

"Antrim."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8.

232. SPHAGNUM CUSPIDATUM. *Ehr.*

"Flow-bogs near Cloughmills."—Moore, Herb. Coll. Sc. Dublin. Boggy marsh near Hillsborough (Down).—S.A.S.

233. S. ACUTIFOLIUM. *Ehr.*

Wet bogs—common throughout the district.

234. S. RUBELLUM. *Wils.*

Not rare. "Collected by Templeton in the North."—Moore, Proc. R. I. Acad., Series II., Vol. I., No. 8. Belfast Hills (Antrim); Conlig (Down).—S.A.S.

235. S. CYMBIFOLIUM. *Ehr.*

Peat bogs—common in Derry, Antrim, and Down. 6-7.

236. ANDRÆA RUPESTRIS. *Dill.* A. Rothii. *Web. and Moh.*

Rocks on the higher hills and mountains—not uncommon. "Abundant through Co. Antrim."—Moore, Herb. Coll. Sc. Dublin. On granite, Slieve Donard; on slate, Slieve Croob (Down).—S.A.S. 4-7.

237. A. ALPINA. *Dill.*

Rocks on the mountains—abundant where it occurs. "Slemish."—Moore, Herb. Coll. Sc. Dublin. Plentiful on trap Slemish Mountain (Antrim); and on granite Slieve Donard (Down).—S.A.S. 4-6.

238. A. PETROPHILA. *Ehr.* A. rupestris. *Hedw.*

Wet mountainous rocks—not rare in such situations. "Abundant on Slemish, and other Antrim Mountains."—Moore, Herb. Coll. Sc. Dublin. Summits of Slieve Gallion (Derry), and Slieve Croob (Down).—S.A.S. 4-6.

A LIST OF THE

CRETACEOUS MICROZOA OF THE NORTH OF IRELAND,

By JOSEPH WRIGHT, F.G.S., F.R.G.S.I.,

Hon. Assoc. of the Belfast Nat. Hist. and Phil. Soc.

FROM the way in which the Chalk of the North of Ireland has been hardened by heat and pressure, consequent on the overflow of the Basalt which everywhere in this country overlies the beds, geologists, until quite recently, had practically failed to find in our Irish Cretaceous rocks any of those beautiful Microzoa which so abound in the English Chalk.

So late as 1872 only one solitary Rhizopod had been recorded, viz., *Orbitolina concava*, found by Mr. Ralph Tate, F.G.S., in the Greensand. Mr. Thomas Galloway, of Belfast, had, however, also found a cast of *Dentalina communis* in flint near that place, and *Cristellaria rotulata* in the Greensand at Cave Hill, but had not recorded their occurrence. On the 13th of November, 1872, a paper was read before the Royal Geological Society of Ireland, by Professor T. Rupert Jones, F.R.S., on four carefully prepared slides of indurated Chalk, and one slide of Chalk flint, which were obtained from the North of Ireland, and had been submitted to him for examination by Professor Hull, Director of the Geological Survey in Ireland. Prof. Jones recognised in these specimens various sections of perfect and fragmentary Foraminifera, belonging to nine different species. In February, 1872, I discovered that the soft powdery material frequently found inside the cavities that often occur in flint, on being washed and cleaned, yielded Ostracoda, Foraminifera, and Sponge spicula, in great profusion; this powder being, in fact, a portion of the old sea bottom of the Cretaceous times. These tiny forms thus preserved in the flint cavities have remained uninjured, notwithstanding influences which converted the surrounding mud into solid limestone. I have since, in company with other members of the Club, examined personally a large portion of the Chalk area of

the North of Ireland, and in addition, through the kindness of Mr. Wm. Gray, M.R.I.A., Mr. S. A. Stewart, F.B.S.E., and Mr. Thomas Galloway, have had an opportunity of examining Chalk powder from 36 different localities in the Counties of Antrim, Londonderry, and Down. Among the many specimens collected from these various places, I have recognised, besides Corals and Polyzoa, 17 species of Ostracoda, 106 species and well marked varieties of Foraminifera, and 27 forms of Sponge spicula; many of these attain fine proportions, being much larger than those usually obtained from the washings of English Chalk. The Microzoa, on being placed in hydrochloric acid, were found to be, either not at all, or but very slightly affected by it, shewing that their original composition has, to a great extent, been replaced by silica. On account of the singular resemblance which many of those large flints known as "Paramoudras," bear to the deep sea siliceous sponge, *Holtenia Carpenteria*, I was specially desirous to obtain material from some of them for examination. Owing to their usually solid nature, this was difficult. I met, however, with several that were suitable, so that I was enabled to investigate the contents of four Paramoudras that were fossiliferous. The following is an analysis of those in question :—

No. 1, from Wolf Hill, near Belfast, 130 Spicula, 57 Foraminifera ; No. 2, from same locality, 130 Spicula, 8 Foraminifera ; No. 3, from Ballytober, Islandmagee, 5 Spicula, Foraminifera in great numbers ; No. 4, from Sallagh Braes, near Larne, Spicula in profusion, Foraminifera plentiful. The above results show that there is no appreciable difference between the contents of Paramoudras and ordinary flints. Both contain Sponge spicula in more or less abundance, the "Paramoudras" not being characterised by any special form of spiculum, which the others do not also contain. The one examined from Sallagh Braes yielded nearly all the different forms of spicula found in our Chalk powder, and in this respect closely resembled what was found in a small ordinary flint at Spring Hill, near Moneymore, Co. Derry ; whilst the "Paramoudra" from Ballytober, Islandmagee, though it contained Foraminifera and Ostracoda in abundance, had but very few spicula. From the general frequency of spicula in flints there cannot, however, I think, be any doubt but that most, if not all, of our nodular flints had their origin in a sponge, or some other soft organism round which the silica aggregated.

The Table given at the end must be considered as only an approximation to the general distribution of the Cretaceous Microzoa over the districts examined, the absence of many of the commoner species at some of the localities may be readily accounted for when we consider the small quantity of powder in some instances obtained. Thus at Larne, and at Spring Hill, near Moneymore, only a few grains of Chalk powder were found, several other localities also yielding but a very limited supply, whilst the flints at Woodburn quarry, as well as those on the shore between Blackhead and Gobbins, yielded, at a single visit, several pounds

weight of the material. Chalk flints are usually found hard and solid throughout, only a small proportion of them having cavities containing Chalk powder. So far as I have observed, those containing the powder appear to be confined to flints that have, for some time, been exposed to the action of the weather, the white material frequently seen in the interior of those newly quarried being always of a hard nature. I have met with Chalk powder in every stage, from powder as fine as the finest flour, to a material so hard that it was difficult to cut it with a penknife. The flints that contain powder may be readily known from the solid ones, by having openings from the outside varying much in size, the only trace at times being a little moss that has taken root on the chalky material exposed near the surface. It is not intended that the present list of Microzoa should be considered exhaustive, our knowledge of the contents of the flints in the North of Ireland is after all but very limited. Many localities in the northern parts of the Counties of Antrim and Londonderry have yet to be explored, whilst at several of the stations already examined the search for Chalk powder has been most cursory, and on several occasions only small samples of it were collected during hurried visits.

The Cretaceous rocks of the North of Ireland are found invariably underlying the Basalt, and are usually well exposed at the base of those hills which occupy the boundary line between it and the sedimentary rocks. They occur as a narrow belt of White Limestone and Greensand around the great basaltic plateau which occupies nearly all Co. Antrim and the eastern part of Co. Derry. I have given the localities for the Chalk Microzoa in the order in which they occur, commencing at Magheralin, the most south-westerly point examined; and then, in a north-easterly direction, through Lisburn, Belfast, Carrickfergus, Islandmagee, to Larne; then, north and north-west, round the coast to the Giant's Causeway; then, inland, into Co. Londonderry, ending in the high escarpment of Slieve Gallion and Keady Hill.

To my friend, Prof. T. Rupert Jones, F.R.S., I am deeply indebted for kind assistance rendered by him in the critical examination of my entire collection of Ostracoda and Foraminifera—an examination which has resulted in the detection of several new species. I am further indebted to Prof. Jones for names and references respecting all the forms here enumerated. Dr. J. S. Bowerbank, F.R.S., has also laid me under weighty obligations, by generously undertaking to revise my whole series of Sponge spicula, a work of peculiar difficulty. His report on the spicula will be given in full. To my friends, Mr. William Gray, M.R.I.A., Mr. Samuel A. Stewart, F.B.S.E., and Mr. Thomas Galloway, I am indebted for kind and liberal assistance in procuring for examination a large amount of material from various localities. To the kindness and skill of my friend Mr. William Swanston I am much indebted for the very accurate drawings in the plates which accompany this memoir.

LIST OF LOCALITIES FROM WHICH CHALK MICROZOA HAVE BEEN OBTAINED:—

1. Magheralin, Co. Down. Quarry about 3 miles S.W. of Moira.

Chalk powder in limited quantity—very rich in Microzoa.

2. Moira, Co. Antrim. Quarry about half-a-mile N. of Moira station.

A considerable quantity of Chalk powder was got in the flints at this place; it contained, however, but few Microzoa, and these usually in poor condition. The powder was frequently found highly coloured, and appeared to have been much altered by the action of heat

3. Kilcorrig, Co. Antrim. Quarry about 3 miles N.W. of Lisburn.

A little powder was found here, very poor in Microzoa.

4. White Mountain, Co. Antrim, 1 mile N.E. of preceding locality.

A little Chalk powder was found at this station, it was poor in Microzoa. This is the only Irish locality where *Lituola inflata* has been found.

5. Colin Glen, Co. Antrim, about 4½ miles S.W. of Belfast.

A few flints were met with up this glen, which yielded a little Chalk powder, poor in Microzoa.

6. Black Hill, near Hannahstown, Co. Antrim. Quarry 3½ miles from Belfast, on the Hannahstown Road.

The Chalk powder found at this quarry was very rich in Microzoa. Two Foraminifera of great interest were met with, viz.: A new *Bulimina*, named by Prof. T. Rupert Jones *Bulimina regularis*—this species is extremely rare, only two specimens of it having as yet been found. The other, a Rotaline form, taking the shape of *Rotalia orbicularis*, with regular openings into each chamber; only one example of this remarkable Rhizopod has been found.

7. Wolf Hill, Co. Antrim. Quarry 2 miles N.W. of Belfast, near the village of Ligoniel.

The Chalk powder found here contained an abundance of the usual forms.

8. Squire's Hill. Quarries near the village of Ligoniel, and not far from the preceding station.

The Chalk powder found in the flints at these quarries yielded the ordinary Chalk Microzoa; Sponge spicules occurred in great abundance.

9. Cave Hill, Co. Antrim. Quarries 2 miles N. of Belfast.

On account of the close proximity of these extensive quarries to the town of Belfast, they have been better examined for Chalk powder than any of the other localities. In the rubbish heaps outside the quarries occur numbers of flints containing Chalk powder, rich in fossil Microzoa. Among the many rare forms found at this place the following may be mentioned as of special interest, viz.: *Lituola (Haplostiche) clavulina*, *Flabellina lingula*, *F. rugosa*, and *Lingulina carinata*.

10. Whitewell, Co. Antrim. Quarry 4 miles N. of Belfast, on the Antrim Road.

The Chalk powder found in the flints in this quarry was rich in the usual fossils. Two very rare Foraminifera were found here, viz.: *Marginulina seminotata*, and *Cristellaria (Saracenaria) Italica*.

11. Whiteabbey, Co. Antrim. Quarry 1 mile W. of Whiteabbey station on the Northern Counties Railway.

The Chalk powder collected from this quarry contained the usual Chalk Ostracoda and Foraminifera, but very few Sponge spicules.

12. Woodburn, Co. Antrim. Quarry at the head of Woodburn Glen, 2½ miles N.W. of Carrickfergus.

I only once visited this quarry, and whilst there collected several pounds weight of Chalk powder; it was found to contain Microzoa in great profusion. Many rare Foraminifera occurred, and all our Irish Chalk Ostracoda, with the exception of *Cythere lernica*. *Vaginulina costulata* and *Gaudryina pupoides*, *var. prælonga*, were among the rare Foraminifera found here.

13. Whitehead, Co. Antrim. Quarry convenient to Whitehead station on the Northern Counties Railway.

A small quantity of Chalk powder was collected at this quarry, it contained the usual Chalk Microzoa; *Frondicularia inversa* has been found in this quarry.

14. Blackhead, Co. Antrim. 1½ miles N.E. of Whitehead station, rocks exposed along the shore under the headland.

A few flints were met with at this spot; they contained Chalk powder in quantity, which proved highly fossiliferous.

15. Near Gobbins. Rocks exposed along the shore about midway between that headland and Blackhead.

About midway between Blackhead and the Gobbins a dyke occurs well exposed in a low cliff, and is composed of a mass of ordinary flints and Paramoudras crowded together, and imbedded in a brown ochreous clay. These flints were found to contain Chalk powder in the greatest quantity—one of the "Paramoudras" examined yielded several pounds weight of the powder. The material collected proved extremely rich in Microzoa; all our Irish Cretaceous Ostracoda were met with, and an unusually large number of Foraminifera referable to 79 species and well marked varieties. The following very rare Foraminifera occurred, viz.: *Dentalina Steenstrupi*, *Marginulina seminotata*, and *Bulimina regularis*.

16. Ballytober, Islandmagee, Co. Antrim. Quarry situated near the centre of the island, between the Gobbins and Magheramorne ferry.

Chalk powder was found here in quantity; the Microzoa were in great abundance, and in fine preservation.

17. Mill Bay, Islandmagee, opposite Magheramorne, Co. Antrim. Quarry about quarter of a mile from the Magheramorne ferry.

The flints in this quarry yielded a fair supply of Chalk powder rich in the usual Microzoa.

18. Magheramorne, Co. Antrim. Quarry convenient to Magheramorne station, on the Northern Counties Railway.

The powder found in the flints in this quarry was highly fossiliferous.

19. Ballycarry, Co. Antrim. Quarry about half-a-mile S. of Ballycarry station, on the Northern Counties Railway.

A large quantity of Chalk powder, extremely rich in fossils, was found in this quarry; all the Cretaceous Ostracoda were met with, besides a great variety of Foraminifera and Sponge spicules.

20. Red Hall Glen, Co. Antrim. One mile N.W. of preceding locality.

Flints occur sparingly scattered over the bed of this fine old glen, having been washed out of the white limestone which at one place forms overhanging cliffs. Many of the flints were found to contain Chalk powder rich in Microzoa.

21. Glenoe, Co. Antrim. Quarry 3 miles S.W. of Magheramorne.

A small quantity of Chalk powder found here was rich in the usual forms.

Larne, Co. Antrim. Small quarry half-a-mile S. of the railway terminus at Larne.

A few grains of powder was found in a flint at this quarry; it contained the following fossils, viz. : *Cythere virginea, C. umbonata, Cythere (Cythereis) ornatissima, C. spiculata, Bairdia subdeltoidea, Cytherella ovata, C. Williamsoni, Paracypris gracilis, Dentalina marginuloides, Cristellaria rotulata, Textularia globulosa, Bulimina ovulum, B. brevis, Virgulina tegulata, Planorbulina ammonoides, Rotalia orbicularis, var.*

22. Waterloo, Co. Antrim. 1 mile N. of Larne, on the coast.

The Chalk powder at this place was highly fossiliferous; 15 different species of Ostracoda were found in it.

23. Sallagh Braes, Co. Antrim. Quarry 4½ miles N.W. of Larne, on the old road to Glenarm.

A "Paramoudra" was found here containing a quantity of Chalk powder; it yielded Sponge spicula in great profusion.

24. Glenarm, Co. Antrim. Quarries near the town of Glenarm, on the Coast road.

I am indebted to my friend Mr. Gray for the only Chalk powder I have seen from this place, as also for what was found at the following seven localities. As I have not visited any of these places myself, and as the samples submitted for examination were small, I can give no information as to relative quantity of the powder; all, however, were found to contain fossil Microzoa in more or less abundance.

25. Carnlough, Co. Antrim. Quarries 1 mile N.W. of the town on the Coast road, 2½ miles N. of Glenarm.

26. Garron Point, Co. Antrim. Quarry on the Coast road, 4½ miles N. of Carnlough.

27. Glenariff, Co. Antrim. Quarries 2½ miles up the glen from Red Bay, on the Coast road.

28. Lurigethan, Co. Antrim. Quarries on the face of a hill 2 miles from Cushendall, on the Coast road.

29. Trostan Mountain, Co. Antrim. Quarry on the north face of the mountain, 3 miles W. of Cushendall.

30. Torr Head, Co. Antrim. North-east corner of Co. Antrim, 11 miles N. of Cushendall, and 8 miles W. of Ballycastle.

31. Ballintoy, Co. Antrim. Quarries at Ballintoy Harbour, 5½ miles N.W. of Ballycastle, on the road to the Giant's Causeway.

32. Whiterocks, Co. Antrim. Quarries on the roadside 3 miles E. of Portrush, on the road to the Giant's Causeway.

A small quantity of Chalk powder collected at this quarry yielded a few Microzoa.

33. North of Moneymore, Co. Londonderry. Quarry about midway between that town and Magherafelt.

A little Chalk powder found in this quarry yielded a few fossils.

34. Springhill, near Moneymore, Co. Londonderry.

A few grains of Chalk powder collected at this quarry yielded vast numbers of Sponge spicules.

35. Slieve Gallion, Co. Londonderry. Quarry situated near the summit of the mountain, 4½ miles N.W. of Moneymore station on the Cookstown line.

This is the highest exposure of White Limestone in the North of Ireland, being at an elevation of 1,500 feet above the level of the sea. The Chalk powder collected at this quarry yielded Microzoa in great abundance and in fine preservation.

36. Keady Hill, Co. Londonderry. Quarries on the face of the hill, 3 miles E. of Newtownlimavady.

The Chalk powder collected at this quarry yielded Microzoa in great abundance.

LIST OF THE CRETACEOUS MICROZOA FOUND IN THE NORTH OF IRELAND.

OSTRACODA.

1. CYTHERE VIRGINEA, *Jones*. Frequent.

2. CYTHERE HARRISIANA, *Jones* (?). (Geol. Mag., Vol. VII., p. 75.) Frequent.

3. CYTHERE UMBONATA, *Williamson*. Frequent.

4. CYTHERE ? WRIGHTII, *sp. nov. Jones, MS.* (Near Bairdia difficilis, *Reuss* "Gaas," Pl. V., fig. 7). Not unfrequent.

5. CYTHERE ? IERNICA, *sp. nov. Jones, MS.* Rare.

6. CYTHERE (CYTHEREIS) ORNATISSIMA, *Reuss*. In great profusion.

7. CYTHERE (CYTHEREIS) ALATA, *Bosquet*. Frequent.

8. CYTHERE (CYTHEREIS) SPICULATA, *sp. nov. Jones, MS.* Frequent.

9. CYTHERE (CYTHEREIS) VALLATA, *sp. nov. Jones, MS.* (Near C. elongata, *Reuss*). Frequent.

10. CYTHERE (CYTHEREIS) MONTUOSA, *sp. nov. Jones, MS.* (Near C. oxyura, *Reuss*). Very rare.

11. CYTHERE (CYTHEREIS) CUSPIDIS, *sp. nov. Jones, MS.* (Near C. oxyura, *Reuss*). Abundant.

12. BAIRDIA SUBDELTOIDEA, *(Münster)*. In the greatest profusion.

13. MACROCYPRIS SILIQUA, *Jones*. Rare.

14. CYTHERELLA OVATA *(Römer)*. In the greatest profusion.

15. CYTHERELLA MUENSTERI, *(Römer)*. Rather frequent.

16. CYTHERELLA WILLIAMSONI, *Jones*. Very abundant.

17. PARACYPRIS ? GRACILIS, *Jones*. Rather frequent.

FORAMINIFERA IMPERFORATA.

MILIOLIDA.

18. TROCHAMMINA CRETACEA *(Reuss)*. Rare.

LITUOLIDA.

19. LITUOLA (HAPLOPHRAGMIUM) INFLATA, *Reuss*. Only two specimens found.

20. LITUOLA (HAPLOSTICHE) CLAVULINA, *Reuss* ("Elbthalgebirge," Pl. XXIV., fig. 7). Only one specimen found.

FORAMINIFERA PERFORATA.

LAGENIDA.

21. LAGENA APICULATA, *Reuss*. Rare.

22. LAGENA SULCATA, *W. & J.* Rather frequent.

23. NODOSARIA GLABRA, *D'Orb.*, and Dentaline variety. A long thin N. radicula *(Linn)*, passing into Dentalina nodosa, *D'Orb.* of his "Mémoire sur la Craie blanche, &c." (not D. nodosa of D'Orb. "Models"). Rather frequent.

24. NODOSARIA RADICULA *(Linn.)*, 3-chambered, thick (near Glandulina discreta, *Reuss*; G. cylindracea, *Alth.*; Marginulina bullata, *Reuss*.) Only one specimen found.

25. NODOSARIA RADICULA *(Linn.)*, tapering; N. lepida, *Reuss* ("Westphalia"). Rare.

26. NODOSARIA RADICULA *(Linn.)*, VAR. (near N. conferta.) Very rare.

27. NODOSARIA PYRULA, *D'Orb.* Rare.

28. NODOSARIA HISPIDA, *D'Orb.* Rather rare.

29. NODOSARIA RAPHANUS *(Linn.)*; N. Zippei, *Reuss*. Rather rare.

30. NODOSARIA RAPHANUS *(Linn.)*, VAR. INFLATA, *Reuss*. Frequent.

31. NODOSARIA RAPHANUS *(Linn.)*, short coarse variety. Abundant.

32. NODOSARIA RAPHANUS *(Linn.)*, small; N. obscura, *Reuss* ("Elbthalgebirge"). Rare.

33. NODOSARIA ACICULA, *Lam.*, slightly Dentaline, and thus passing into Dentalina obliqua *(Linn.)*. Frequent.

34. NODOSARIA (DENTALINA) LIMBATA, *D'Orb.* Rare.

35. DENTALINA COMMUNIS, *D'Orb.*, with oblique septa. Frequent.

36. DENTALINA COMMUNIS, *D'Orb.*, VAR. LORNEIANA, *D'Orb.*, passing into D. Boueana, *D'Orb.* Frequent.

37. DENTALINA COMMUNIS, *D'Orb.*, VAR. IRREGULARIS, *D'Orb.* The nearest figured specimen is Nodosaria monile, Von Hag., in Reuss' "Kreid. Böhm." t. 8. f. 9 (not f. 7. which, however, Reuss regards as the true "monile"); Dentalina nodosa, *D'Orb.*, "Mém. Craie blanche" (not Soldani) is probably the same; N. irregularis, *D'Orb.*, "For. Fos. Vien.," is the same with longer chambers; and N. longiscata, *D'Orb.*, has very elongate chambers of the same style. Rare.

38. DENTALINA COMMUNIS, *D'Orb.*, VAR.; D. Lilli, *Reuss* ("Kreid. Lemberg," Pl. II. fig. 11). Rather rare.

39. DENTALINA COMMUNIS, *D'Orb.*, exquisitely delicate var. near D. peracuta, *Reuss*. Rare.

40. DENTALINA COMMUNIS, *D'Orb.*, VAR. EMACIATA, *Reuss*. Very rare.

41. DENTALINA PAUPERATA, *D'Orb.*, with straight septa. In great profusion.

42. DENTALINA STEENSTRUPI, *Reuss* ("Meklenburg"). Only one specimen found.

43. DENTALINA NODOSA, *D'Orb.*, var. with flush and short chambers, marked with delicate lines, near D. nodosa, *D'Orb.* (Soldani); D. lineolata, *Reuss* ("Bohemia"); D. multilineolata, *Reuss* ("Elbthalgebirge"); D. proteus, *Reuss* ("Maestricht"); D. polyphragma, *Reuss* ("Westphalia"); Nodosaria subornata, *Reuss* ("Dobrutscha" f. 9, 10; the shape being that of f. 5, N. inarticulata, *Reuss*), and others. Rare.

44. DENTALINA MARGINULINOIDES, *Reuss* ("Lemberg," Pl. II. f. 12), subseptate variety. Rather rare.

45. DENTALINA MARGINULINOIDES, *Reuss*, cylindrical variety. Rather rare.

46. FRONDICULARIA STRIATULA, *Reuss* ("Elbthalgebirge," Pl. XXI. fig. 2). Frequent.

47. FRONDICULARIA AUGUSTATA, *Nilsson* (according to Reuss). A narrow sub-variety of F. striatula. Rare.

48. FRONDICULARIA VERNEUILIANA, *D'Orb.*, narrow variety. Rather rare.

49. FRONDICULARIA ARCHIACIANA, *D'Orb.* Frequent.

50. FRONDICULARIA TENUIS, *Reuss* ("Elbthalgebirge," Pl. XXI. f. 3). Rare.

51. FRONDICULARIA INVERSA, *Reuss*. Only one specimen found.

52. FRONDICULARIA ELLIPTICA (*Nilsson*). Very rare.

53, FRONDICULARIA MUCRONATA, *Reuss* ("Elbthalgebirge") VAR. with trifid mucro; ? F. Goldfussi, *Reuss* ("Westphalia"). Rather rare.

54. FLABELLINA LINGULA, *Von Hagenow*, VAR. Only two specimens found.

55. FLABELLINA RUGOSA, *D'Orb.* Very rare.

56. FLABELLINA RETICULATA, *Reuss*. Frequent.

57. FLABELLINA PULCHRA, *D'Orb.* Very rare.

58. FLABELLINA PULCHRA, *D'Orb.*, narrow neat variety, near Fr. obliqua, *Von Münster*. Very rare.

59. FLABELLINA PULCHRA, *D'Orb.*, a smooth variety with parallel sides; a narrow form of Fr. obliqua, *Alth* ("Lemberg"). Very rare.

60. FLABELLINA ORNATA, *Reuss* ("Kreid. Bohm.," Pl. XXIV. fig. 43); near Cristellaria crepidularis, *Reuss* ("Gault"); ? F. Baudouiniana, *D'Orb.* Only one specimen found.

61. LINGULINA CARINATA, *D'Orb.* VAR.; broad and short. Only two specimens found.

62. MARGINULINA GLABRA, VAR. ELONGATA, *D'Orb.* Abundant.

63. MARGINULINA BULLATA, *Reuss* ("Westphalia" Pl. VI. fig. 4). Rather rare.

64. MARGINULINA RADICULA *(Linn.)*; smooth flush Nodosaria radicula with excentric aperture. Only one specimen found.

65. MARGINULINA SEMINOTATA, *Reuss* ("Westphalia Kreid.," Pl. V. fig. 6). Very rare.

66. MARGINULINA RAPHANUS *(Linn.)*; Nodosaria raphanus with excentric aperture. Only one specimen found.

67. VAGINULINA (MARGINULINA) TRILOBATA, *D'Orb.;* Marginulina bacillum, *Reuss.* Frequent.

68. VAGINULINA (CITHARINA) HARPA, *Röm.* VAR. NOV., near V. discors, *Reuss*, and V. arguta, *Reuss* ("Gault," Pl. III. fig. 10 and 12). Rare.

69. VAGINULINA COSTULATA, *Reuss.* Only one specimen found.

70. VAGINULINA COSTULATA, *Römer* (Reuss, "Elbthalgebirge," Pl. XX. fig. 24). Variety, thin and slightly curved. Only two specimens found.

71. PLANULARIA, SP. (near Planularia longa), *Cornuel.* Very rare.

72. PLANULARIA CREPIDULA, *D'Orb.*, becoming Flabellina pulchra, *D'Orb.* Very rare.

73. CRISTELLARIA RECTA, *D'Orb.* Rather rare.

74. CRISTELLARIA RECTA, *D'Orb.* VAR. HAMOSA, *Reuss* ("Elbthalgebirge," Pl. XXIV. fig. 2). Rare.

75. CRISTELLARIA RECTA, *D'Orb.* (near C. Bronni, *Römer*) (Reuss, "Gault," Pl. VII. f. 13). Only one specimen found.

76. CRISTELLARIA ROTULATA *(Lam.)*. In great profusion.

77. CRISTELLARIA NAVICULA, *D'Orb.* Rare.

78. CRISTELLARIA TRIANGULARIS, *D'Orb.* Very rare.

79. CRISTELLARIA (SARACENARIA) ITALICA, *Defrance.* Very rare.

80. CRISTELLARIA (SARACENARIA) ITALICA, *Defrance*, a long sub-variety. One specimen found.

81. POLYMORPHINA DAMÆCORNIS, *Reuss*, Pl. III. figs. 16 and 17. Very rare.

82. POLYMORPHINA HORRIDA, *Reuss*, Pl. III. figs. 14 and 15. Rather rare.

83. POLYMORPHINA FUSIFORMIS, *Römer*. Not unfrequent.

84. POLYMORPHINA REGINA, *B. P. & J.*, VAR. Very rare.

85. UVIGERINA NODOSA, *D'Orb.* Very rare.

GLOBIGERINIDA.

86. GLOBIGERINA CRETACEA, *D'Orb.* In great profusion.

87. GLOBIGERINA BULLOIDES, *D'Orb.* Very rare.

88. GLOBIGERINA BULLOIDES, *D'Orb.*, VAR. NOV., heaped. Very rare.

89. GLOBIGERINA MARGINATA *(Reuss)*. Rare.

90. PULLENIA QUINQUELOBA *(Reuss)*. Rather rare.

91. TEXTULARIA GIBBOSA, *D'Orb.* Rare.

92. TEXTULARIA PUPA, *Reuss* ("Westphalia"). Rather rare.

93. TEXTULARIA SAGITTULA, *Defrance*. Abundant.

94. TEXTULARIA TROCHUS, *D'Orb.* Rare.

95. TEXTULARIA TURRIS, *D'Orb.* Rare.

96. TEXTULARIA TURRIS, *D'Orb.*, short and thick varieties. Frequent.

97. TEXTULARIA FŒDA, *Reuss*. Frequent.

98. TEXTULARIA PRÆLONGA, *Reuss*. Rather rare.

99. TEXTULARIA GLOBULOSA, *Ehr.* In great abundance, but liable to be overlooked from its minute size.

100. VERNEUILINA TRIQUETRA, *(Münster)*. Rather rare.

101. GAUDRYINA RUGOSA, *D'Orb.* Frequent.

102. GAUDRYINA PUPOIDES, *D'Orb.* VAR. PRÆLONGA *(Reuss)*. Rare.

103. TRITAXIA TRIQUETRA *(Münster)*. Rather rare.

104. BULIMINA PRESLI, *Reuss*. Frequent.

105. BULIMINA OVULUM, *Reuss*. Abundant.

106. BULIMINA BREVIS, *D'Orb.* In great abundance.

107. BULIMINA INTERMEDIA, *Reuss*. Rather rare.

108. BULIMINA REGULARIS, *sp. nov. Jones, MS.* (near B. marginata, *D'Orb.*). Only one good example found.

109. ? BULIMINA, SP. Very rare.

110. VIRGULINA TEGULATA, *Reuss*, VAR. In great abundance.

111. BOLIVINA DECORATA, *sp. nov. Jones, MS.* Very abundant.

112. BOLIVINA, SP. Exquisitely delicate form. Only one specimen found.

113. PLEUROSTOMELLA FUSIFORMIS, *Reuss* ("Westphalia"). Rare.

114. PLANORBULINA* EXSCULPTA, *Reuss* ("Westphalia"). Frequent.

115. PLANORBULINA AMMONOIDES *(Reuss)*. In the greatest profusion.

116. PLANORBULINA AMMONOIDES *(Reuss)*, VAR. with extra shell-growth, making astral overgrowth on the umbilicus. In great profusion.

117. PLANORBULINA CRENULATA *(Reuss)*, ("Gaas," Pl. II. fig. 2). Rather rare.

118. TRUNCATULINA LOBATULA *(W. & J.)*. Frequent.

119. PULVINULINA MICHELINIANA *(D'Orb.)* VAR. Frequent.

120. ROTALIA ORBICULARIS (*D'Orb.*), VAR. In great profusion.

121. ROTALIA vel PLANORBULINA? Pl. III. fig. 18. A Rotaline form, like R. orbicularis in shape, but having each chamber symmetrically perforated with a large central aperture on the outside. Only one specimen found. Prof. T. Rupert Jones says:—"This specimen is of great interest, when considered with the few other known *open-chambered* Foraminifera. Ehrenberg figures ('Mikrogeologie,' Pl. XIX. fig. 8), a *Pulvinulina* (?) having a symmetrical series of holes, one at the base of each chamber, around the large convex central chamber; and he figures some *Rotaliæ*

* Prof. W. K. PARKER, F.R.S., has kindly favoured us with his opinion on the *Rotalinæ* and some of the more obscure of the other *Foraminifera* of this list.

and *Planorbulinæ* with less regular holes. M. Vanden Broeck, of Brussels, has lately discovered a Lageniform 'porcellanous' Foraminifer with a regularly cribrate or latticed shell. Thus in both divisions of the *Foraminifera* we have open-chambered shells, *analogous* to the basket-like structure of the siliceous *Polycystina* (*Radiolaria*). How far these may be taken as indications of another, or other divisions of the Rhizopods, further research will show."

122. Fragments of tubular branched forms more or less aculeate near to the so called Dentalina (?) aculeata of D'Orbigny. My friend Professor T. Rupert Jones proposes to distinguish this simple, calcareous, subsegmented, branching, Nodosarian form by the "generic" name RAMULINA (from "ramulus," a little branch); the "species" above mentioned, which is common in the French and British chalk standing as Ramulina aculeata (*D'Orb.*), and our Irish form, which differs from D'Orbigny's in being smooth, as RAMULINA LÆVIS, *gen. et sp. nov. Jones*, see Pl. III. fig. 19. Rather rare.

123. RAMULINA BRACHIATA, *sp. nov. Jones*, see Pl. III. fig. 20. Very rare. Professor T. Rupert Jones says of this form that its nearest known analogue in external form among Protozoa is perhaps Dr. Wyville Thomson's *Cœlosphæra tubifex*, a peculiar Sponge from the North Atlantic. Still the fixed position of the tubes and the general aspect of the organism are against the probability of these Microzoa being closely allied.

SPONGE SPICULA.*

SKELETON-SPICULA.

124. Acerate spiculum, Pl. II. figs. 1 and 2. This form is found abundantly in the Halichondroid sponges both recent and fossil, but it is generally very minute. The same form also prevails to a great extent in the skeletons of many species of *Tethea* and *Geodia*, in both of which these spicula are of about the same size and form as those found in the Chalk, and I have no doubt that they are from fossil species of one or the other of these genera. Frequent.

125. Attenuato-acuate spiculum; an abnormal form, Pl. II. fig. 3. Very rare.

126. Moniliform attenuato-acuate spiculum, Pl. II. fig. 4. Rather frequent.

* I am indebted to J. S. BOWERBANK, LL.D., F.R.S., for the following report on the Sponge spicula.

127. Furcated porrecto-ternate moniliform spiculum, Pl. II. fig. 5. This is probably an external defensive spiculum from a Sponge closely allied to *Tethea*. I have seen from our southern Chalk the same form with moniliform shaft and radii, but not so distinctly banded. Rather rare.

128. Equiangular triradiate spiculum, Pl. II. fig. 6. This form occurs as a siliceous form rarely, but abundantly in the calcareous Sponges as skeleton spicula. Rare.

129. Spiculated equiangular triradiate spiculum, Pl. II. fig. 7. This occurs as a siliceous form rarely, but abundantly in the calcareous Sponges as internal defensive spicula.* Abundant.

CONNECTING-SPICULA.

130. Incipiently expanso-ternate spiculum, probably from a *Geodia*, Pl. II. fig. 8. It is not uncommon in our southern flints. Rare.

131. Expando-ternate spiculum; closely allied to the last, Pl. II. figs. 9 and 10. This form is found in recent *Tethea*, *Geodia*, and other genera. Frequent.

132. Expando-ternate spiculum, with cylindrical radii, Pl. II. figs. 11 and 12. This form is found in some recent species of *Tethea*, but is not a normal condition. Rather rare.

133. Furcated attenuato-patento-ternate spiculum, Pl. II. fig. 13. This constricted form of an apparently furcated attenuato-patento-ternate spiculum has not yet been found among recent Sponges. It occurs in our southern Chalk flints. Rather rare.

134. Furcated attenuato-patento-ternate spiculum, Pl. II. figs. 14 to 16. This form of spiculum abounds in the expansile dermal system of several of the siliceo-fibrous Sponges, as in that of *Dactylocalyx Bowerbankii*, Johnson (Proc. Zool. Soc. 1869, Pl. III. figs. 6, 7). These spicula vary in form and size to a considerable extent in the same species. In great profusion.

135. Furcated attenuato-patento-ternate spiculum, Pl. II. fig. 17; from the expansile dermal system of a siliceo-fibrous Sponge. In great profusion.

* This rarity of some of our forms of spicula in recent *siliceous* Sponges is of considerable interest, in connection with the fact that *all* the little organisms in the powder from our flints seem to be now silicified, whether they were originally *calcareous* (as the *Foraminifera* and *Ostracoda*) or not.

136. Furcated attenuato-patento-ternate spiculum, Pl. II. fig. 18; same as the last, but probably from a different species of Sponge. Frequent.

137. Recurvo-ternate spiculum, Pl. II. fig. 19; similar spicula occur in the intermarginal cavities of *Tethea* and *Geodia*, and these are probably from similar positions in the fossil species of these genera. Very rare.

138. Spiculum, Pl. III. fig. 1. This form is quite new to me. It is most probably from the expansile dermal system of a siliceo-fibrous Sponge. Rather rare.

139. Spiculum, Pl. III. figs. 2 and 3. Singular and probably abnormal form of dermal spiculum of a siliceo-fibrous Sponge. Rather rare.

140. Porrecto-ternate spiculum, Pl. II. fig. 20. This form of spiculum occurs in some species of *Tethea* (*Tethea cranium*, British). An external defensive spiculum. Frequent.

141. Porrecto-ternate spiculum, Pl. II. fig. 21. Very rare.

142. Porrecto-ternate spiculum, Pl. II. fig. 22; same as the last, but probably indicating a different species. Rather rare.

143. Attenuated rectangulate hexradiate spiculum, Pl. III. figs. 4 and 5, from a siliceo-fibrous Sponge (see "Mon. Brit. Spongiadæ," Vol. I. Pl. VII. fig. 174). In great profusion.

SKELETON-FIBRES.

144. Fragments of skeleton-fibres of a siliceo-fibrous Sponge, Pl. III. figs. 6 and 7. Very rare.

145. Apparently fragments of skeleton fibre of a siliceo-fibrous Sponge, Pl. III. figs. 8 and 9. Abundant.

146. Fragments of skeleton fibre of a siliceo-fibrous Sponge, Pl. III. fig. 10. Rare.

The following additional forms were found too late for insertion in the body of the report:—

SPONGE SPICULES.

147. Sphero-stellate spiculum, Pl. III. fig. 11. Very rare.

148. Recurvo-dentate quaternate spiculum, Pl. II. fig. 23. Very rare.

149. Spiculum? Pl. III. fig. 12. A spherical body ornamented with five delicate projecting limbs, three on the one plane and one at either end. Only one specimen found.

150. Spiculum? Pl. III. fig. 13. A spherical body covered with numerous projecting limbs. The few specimens found varied much in size.

FORAMINIFERA PERFORATA.

GLOBIGERINIDA.

151. SPIROPLECTA PRÆLONGA (*Reuss*). Zoologically the same as Spiroplecta sagittula (*Defrance*). Very rare.

TABLE SHEWING THE GEOGRAPHICAL DISTRIBUTION IN

	List of Species.	Magheralin. 1	Moira. 2	Kilcorrig. 3	White Mountain. 4	Colin Glen. 5	Black Hill. 6	Wolf Hill. 7	Squire's Hill. 8	Cave Hill. 9	Whitewell. 10	Whiteabbey. 11	Woodburn. 12	Whitehead. 13
	OSTRACODA.													
1.	Cythere virginea, *Jones*	x	..	x	..	x	x	x	..	x	x	x	x	x
2.	Cythere Harrisiana, *Jones* (?)	..	..	..	..	..	x	x	..	x	x	x	x	x
3.	Cythere umbonata, *Williamson*	x	..	..	..	..	x	..	..	x	x	x	x	x
4.	Cythere ? Wrightii, sp. nov. *Jones, MS.*	x	..	..	..	x	x	..	..	x	x	x	x	..
5.	Cythere ? Iernica sp. nov. *Jones, MS.*	..	..	..	..	..	x	..	..	..	..	..	..	..
6.	Cythere (Cythereis) ornatissima, *Reuss*	x	x	..	..	..	x	x	..	x	x	x	x	x
7.	Cythere (Cythereis) alata, *Bosquet*	..	..	..	..	..	x	x	x	..	x	x	x	..
8.	Cythere (Cythereis) spiculata, sp. nov. *Jones*, MS.	..	..	..	..	..	..	x	..	..	..	..	x	..
9.	Cythere (Cythereis) vallata, sp. nov. *Jones, MS.*	x	..	..	..	..	x	x	..	x	..	x	x	..
10.	Cythere (Cythereis) montuosa, sp. nov. *Jones, MS.*	..	..	..	..	..	..	..	..	..	x	..	x	..
11.	Cythere(Cythereis)cuspidis,sp.nov.*Jones, MS*	x	..	..	..	..	x	x	..	x	x	x	x	x
12.	Bairdia subdeltoidea, *(Munster)*	x	..	x	x	..	x	x	..	x	x	x	x	x
13.	Macrocypris siliqua, *Jones*	..	..	..	..	..	..	..	..	..	..	..	x	..
14.	Cytherella ovata, *(Romer)*	x	x	x	x	x	x	x	..	x	x	x	x	x
15.	Cytherella Muensteri, *(Romer)*	x	..	..	..	..	x	..	..	x	x	x	x	x
16.	Cytherella Williamsoni, *Jones*	x	..	..	x	..	x	x	..	x	x	x	x	x
17.	Paracypris ? gracilis, *Jones*	..	..	..	x	x	x	..	..	..	x	..	x	..
	FORAMINIFERA.													
18.	Trochammina cretacea, *(Reuss)*	x	..	..	..	..	..	..	..	x	..	..	..	..
19.	Lituola (Haplophragmium) inflata, *Reuss*	..	..	..	x	..	..	x	..	..	..	..	..	..
20.	Lituola (Haplostiche) clavulina, *Reuss*	..	..	..	..	..	..	..	..	x	..	..	..	..
21.	Lagena apiculata, *Reuss*	x	..	..	x	..	x	x	..	x	..	x	..	..
22.	Lagena sulcata. *W. & J.*	..	..	..	..	..	..	..	..	..	x	..	x	..
23.	Nodosaria glabra, *D'Orb.*	x	x	..	..	..	x	x	..	x	x	x	x	..
24.	Nodosaria radicula *(Linn.)*, (3 chambered, thick)	..	..	..	..	..	..	..	..	..	x	..	..	..
25.	Nodosaria radicula *(Linn.)*, (tapering)	..	..	..	..	..	..	..	..	..	..	..	..	..
26.	Nodosaria radicula *(Linn.)*, var. near N. conferta	..	..	..	..	..	..	..	..	..	..	..	x	..
27.	Nodosaria pyrula, *D'Orb.*	..	..	..	..	..	..	..	x	..	..	..	..	..
28.	Nodosaria hispida, *D'Orb*	..	..	..	..	..	..	..	..	..	..	x	x	x
29.	Nodosaria raphanus, *(Linn.)*	x	x	..	x	..	..	..	..	x	x	x	x	..
30.	Nodosaria raphanus *(Linn.)*, var. inflata, *Reuss*	x	..	x	..	..	x	x	..	x	x	x	x	..
31.	Nodosaria raphanus *(Linn.)*, short coarse variety	x	x	..	..	..	..	x	..	x	x	x	x	x
32.	Nodosaria raphanus (*Linn.*), (small)	..	..	..	..	..	..	..	..	x	x	..	x	..
33.	Nodosaria acicula, *Lam.*	..	..	x	..	..	x	x	..	x	x	x	x	..
34.	Nodosaria (Dentalina) limbata, *D'Orb.*	x	..	..	..	x	..	..	..	..	x	x	x	..
35.	Dentalina communis, *D'Orb.*	x	..	..	..	..	x	x	..	x	x	x	x	x
36.	Dentalina communis, *D'Orb.*; var. Lorneiana, *D'Orb*	..	..	..	..	..	x	x	..	x	..	x	x	x
37.	Dentalina communis, *D'Orb.*; var. irregularis *(D'Orb.)*	..	..	..	..	..	..	..	..	..	x	..	x	..

THE NORTH OF IRELAND OF THE CRETACEOUS MICROZOA.

Blackhead.	Near Gobbins.	Ballytober.	Near Mill Bay.	Magheramorne.	S. of Ballycarry.	Redhall Glen.	Glenoe.	Waterloo.	Sallagh Braes.	Glenarm.	Carnlough.	Garron Point.	Glenariff.	Lurigethan.	Trostan Mtn.	Torr Head.	Ballintoy.	White Rocks.	N. of Moneymore	Spring Hill.	Slieve Gallion.	Keady Hill.	
14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	..	×	×	×	×	1.
..	×	×	×	×	×	×	..	×	×	×	×	..	×	×	×	×	×	..	..	..	×	×	2.
..	×	×	×	×	×	×	×	×	×	×	×	..	×	×	×	×	×	..	..	×	×	×	3.
..	×	×	×	×	×	×	..	×	×	×	×	..	×	×	×	×	×	..	..	×	×	×	4.
×	×	×	×	×	×	×	×	×	×	×	×	..	×	×	×	×	×	..	×	×	×	×	5.
..	×	×	×	×	×	×	×	×	×	×	×	..	×	×	×	×	×	..	..	..	×	×	6.
..	×	×	×	×	×	×	×	×	..	×	×	×	×	×	..	..	×	..	..	×	×	×	7.
..	×	×	×	×	×	×	×	×	..	×	×	×	×	×	×	..	×	..	..	..	..	×	8.
..	×	×	×	×	×	×	×	×	..	×	×	×	×	×	..	..	×	..	..	×	×	×	9.
..	×	×	×	×	×	×	×	×	..	×	×	..	×	×	..	×	×	..	..	×	..	×	10.
..	×	×	×	×	×	×	×	×	..	×	×	..	×	×	..	×	×	..	..	×	×	×	11.
×	×	×	×	×	×	×	×	×	..	×	×	×	×	×	..	×	×	×	..	×	×	×	12.
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×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	..	×	×	×	×	14.
×	×	×	×	×	×	×	×	×	×	×	×	..	×	×	×	×	×	..	..	×	×	×	15.
×	×	×	×	×	×	×	×	×	×	×	×	..	×	×	×	×	×	..	..	×	×	×	16.
×	×	×	×	×	×	×	×	×	×	×	×	..	×	×	×	×	×	..	..	×	×	×	17.
..	..	×	×	×	×	..	..	..	..	..	..	..	..	..	..	..	×	..	..	×	×	×	18.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	19.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	20.
×	×	..	..	..	..	..	..	..	×	..	×	..	..	..	..	..	..	..	..	..	×	×	21.
..	×	×	×	×	×	..	×	..	..	×	×	..	..	..	×	..	..	×	..	..	×	×	22.
..	×	×	×	×	×	..	×	×	×	×	×	..	..	..	..	..	..	..	..	×	×	×	23.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	24.
×	×	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	25.
..	×	×	..	..	..	×	..	..	..	..	..	..	..	×	..	..	..	..	..	..	..	×	26.
..	..	×	..	..	..	..	..	..	×	..	..	..	..	..	..	..	..	..	..	..	..	..	27.
..	×	×	×	×	×	..	..	×	×	×	..	..	×	×	×	..	..	×	×	..	×	×	28.
×	×	×	..	×	×	..	×	×	×	×	×	..	×	×	×	..	×	..	..	×	×	×	29.
..	×	×	..	×	×	..	..	..	..	..	×	..	..	×	..	..	..	..	..	..	..	..	30.
..	×	×	×	×	×	×	..	×	×	×	×	..	×	×	..	..	×	×	..	..	×	×	31.
×	×	..	..	..	..	×	..	..	..	..	..	..	..	..	..	..	..	..	..	×	..	..	32.
..	×	×	..	..	..	×	×	×	×	..	..	..	..	..	×	..	..	..	..	..	..	..	33.
..	..	×	×	..	×	..	×	×	×	×	×	..	×	×	..	..	×	..	..	×	×	×	34.
×	×	×	×	×	×	×	×	×	×	×	×	..	×	×	..	..	×	..	..	×	×	×	35.
..	×	..	×	..	..	..	..	..	×	×	.	..	..	..	..	..	×	..	..	..	×	×	36.
..	×	..	..	..	×	..	..	..	..	..	..	..	..	×	..	..	..	..	..	..	..	..	37.

TABLE SHEWING THE GEOGRAPHICAL DISTRIBUTION IN THE

	List of Species.	Magheralin. 1	Moira. 2	Kilcorrig. 3	White Mountain. 4	Colin Glen. 5	Black Hill. 6	Wolf Hill. 7	Squire's Hill. 8	Cave Hill. 9	Whitewell. 10	Whiteabbey. 11	Woodburn. 12	Whitehead. 13
38.	Dentalina communis, *D'Orb.*; var. Lilli, *Reuss*	..	..	..	..	..	..	x	..	x	..	..	x	..
39.	Dentalina communis, *D'Orb.*, exquisitely delicate variety	..	..	..	..	..	..	x	..	x	x	x	x	..
40.	Dentalina communis, *D'Orb.*; var. emaciata, *Reuss*	..	..	..	..	..	..	..	..	..	..	..	..	..
41.	Dentalina pauperata, *D'Orb.*	x	x	..	x	x	x	x	..	x	x	x	x	x
42.	Dentalina Steenstrupi, *Reuss*	..	..	..	..	..	..	..	..	..	..	..	..	..
43.	Dentalina nodosa, *D'Orb.*, var.	..	..	..	..	..	..	..	..	..	x	x	x	x
44.	Dentalina marginulinoides, *Reuss.* Subseptate variety	x	x	..	..	..	..	..	..	..	..	..	x	..
45.	Dentalina marginulinoides, *Reuss.* Cylindrical variety	..	..	..	..	..	..	..	..	..	..	..	..	..
46.	Frondicularia striatula, *Reuss*	..	..	..	..	..	x	..	x	..	x	x	x	..
47.	Frondicularia angustata, *Nilsson*	..	..	..	..	..	..	..	..	x	..	..	..	..
48.	Frondicularia Verneuiliana, *D'Orb.*	..	..	..	..	..	..	..	..	x	..	..	x	..
49.	Frondicularia Archiaciana, *D'Orb.*	x	..	..	..	..	x	..	..	x	x	..	x	..
50.	Frondicularia tenuis, *Reuss.*	..	..	..	..	..	..	..	..	x	..	..	x	..
51.	Frondicularia inversa, *Reuss*	..	..	.	..	..	..	..	..	..	..	..	..	x
52.	Frondicularia elliptica *(Nilsson)*	..	..	..	..	..	..	..	..	x	..	..	x	..
53.	Frondicularia mucronata, *Reuss*, var.	x	..	..	..	..	x	..	..	x	x	..	x	x
54.	Flabellina lingula, *Von Hagenow*, var.	..	..	..	..	..	x	..	..	x	..	..	..	..
55.	Flabellina rugosa, *D'Orb.*	..	..	..	..	..	..	..	..	x	..	..	..	..
56.	Flabellina reticulata, *Reuss.*	x	..	..	..	..	x	x	..	x	x	x	x	..
57.	Flabellina pulchra, *D'Orb.*	..	..	..	..	..	..	..	..	x	..	..	..	..
58.	Flabellina pulchra, *D'Orb.* Narrow neat variety	..	..	..	..	..	..	..	..	..	..	..	x	..
59.	Flabellina pulchra, *D'Orb.* Smooth variety with parallel sides	..	..	..	..	..	..	..	..	..	..	..	x	..
60.	Flabellina ornata, *Reuss*	..	..	..	..	..	..	..	..	..	..	..	..	..
61.	Lingulina carinata, *D'Orb.*, var.	..	..	..	..	..	..	..	..	x	..	..	..	..
62.	Marginulina glabra, var. elongata, *D'Orb.*	..	..	..	..	..	x	x	..	x	x	x	x	..
63.	Marginulina bullata, *Reuss.*	..	..	..	..	..	..	..	..	..	..	..	..	..
64.	Marginulina radicula *(Linn.)*	..	..	..	..	..	..	..	..	x	..	..	..	..
65.	Marginulina seminotata, *Reuss*	..	..	..	..	..	..	..	..	..	x	..	..	..
66.	Marginulina raphanus *(Linn.)*	..	..	..	..	..	..	..	..	x	..	..	..	..
67.	Vaginulina (Marginulina) trilobata, *D'Orb.*	..	..	..	..	..	x	x	..	x	x	..	x	..
68.	Vaginulina (Citharina) harpa, *Rom.*, var. nov.	..	..	..	..	..	..	..	..	..	..	..	x	..
69.	Vaginulina costulata, *Reuss.*	..	..	..	..	..	..	..	..	..	..	..	x	..
70.	Vaginulina costulata, *Rom.* Variety thin and slightly curved	..	..	..	..	..	..	..	..	x	..	..	x	..
71.	Planularia sp., near Planularia longa, *Cornuel.*	..	..	..	..	..	..	..	..	..	..	..	..	x
72.	Planularia crepidula, *D'Orb.*, becoming Flabellina pulchra, *D'Orb.*	..	..	..	..	..	x	..	..	..	..	..	..	..
73.	Cristellaria recta, *D'Orb.*	x	..	..	..	x	x	x	..	x	x	..	x	..
74.	Cristellaria recta, *D'Orb.*; var. hamosa, *Reuss.*	..	..	..	..	..	..	..	..	..	..	..	..	..
75.	Cristellaria recta, *D'Orb.*, near C. Bronni	..	..	..	..	..	..	..	..	x	..	..	..	..
76.	Cristellaria rotulata *(Lam.)*	x	x	x	x	x	x	x	..	x	x	x	x	x
77.	Cristellaria navicula, *D'Orb.*	x	..	..	..	..	..	x	..	..	..	..	x	..
78.	Cristellaria triangularis, *D'Orb.*	x	..	..	..	..	..	..	..	..	..	x	x	..
79.	Cristellaria (Saracenaria) Italica, *Defrance...*	..	..	..	..	..	..	..	..	..	x	..	..	..
80.	Cristellaria (Saracenaria) Italica, *Defrance*, long sub-variety	..	..	..	..	..	..	..	..	x	..	..	..	..
	Polymorphina damæcornis, *Reuss.*	..	..	..	..	..	..	..	..	..	..	..	..	..

NORTH OF IRELAND OF THE CRETACEOUS MICROZOA—*(Continued)*.

Blackhead.	Near Gobbins.	Ballytober.	Near Mill Bay.	Magheramorne.	S. of Ballycarry.	Redhall Glen.	Glenoe.	Waterloo.	Sallagh Braes.	Glenarm.	Carnlough	Garron Point.	Glenariff.	Lurigethan.	Trostan Mtn.	Torr Head.	Ballintoy.	White Rocks.	N. of Moneymore	Spring Hill.	Slieve Gallion.	Keady Hill.	
14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
..	..	..	..	..	×	..	..	..	×	..	..	..	..	..	..	..	..	..	..	..	×	×	38.
×	×	..	..	×	×	..	..	..	..	..	..	..	..	×	..	..	..	..	..	..	..	×	39.
..	×	..	×	×	..	×	..	×	×	..	..	..	..	×	..	×	..	..	..	..	×	×	40.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	41.
..	×	×	×	×	×	×	..	×	..	..	..	..	..	..	..	..	..	..	..	..	×	..	42.
..	×	..	..	×	×	..	..	..	×	..	..	..	..	..	..	..	×	..	..	..	..	..	43.
..	×	..	..	×	×	..	..	×	..	..	..	..	..	..	..	..	..	..	..	..	..	..	44.
..	×	..	..	×	×	..	..	×	×	..	..	..	..	×	..	×	..	..	..	..	..	..	45.
×	×	..	×	×	×	×	×	×	..	..	..	..	×	..	×	×	..	..	..	..	..	×	46.
×	×	..	..	..	×	..	×	..	×	×	..	..	..	..	..	..	..	..	..	..	×	..	47.
×	×	×	..	..	×	×	×	..	..	×	..	..	..	..	×	..	..	..	..	..	×	..	48.
..	×	..	..	..	..	..	..	×	×	×	..	..	..	..	..	..	..	..	..	..	..	..	50.
..	×	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	51.
..	×	..	..	×	×	..	..	×	×	×	..	..	×	×	..	..	..	..	..	..	..	×	53.
..	×	..	..	×	×	..	×	×	×	×	..	..	..	×	..	..	..	×	..	×	×	×	56.
..	×	..	×	..	×	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	57.
..	×	..	×	..	×	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	58.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	59.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	..	..	..	..	..	..	60.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	61.
..	×	×	..	×	×	×	×	×	×	×	×	×	..	×	..	..	..	×	..	..	×	×	62.
..	×	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	63.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	64.
..	×	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	65.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	66.
..	×	..	..	..	×	..	..	..	..	..	..	×	..	..	..	..	..	..	..	..	..	×	67.
..	×	..	..	..	×	×	×	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	68.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	69.
..	..	..	×	..	..	..	..	..	..	..	..	..	×	..	..	..	..	..	..	..	..	..	70.
..	..	..	..	..	×	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	71.
..	×	×	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	72.
..	×	×	..	..	..	..	..	..	×	..	..	..	..	..	..	..	×	..	..	..	..	×	73.
..	..	..	..	..	..	..	..	..	×	..	..	..	..	..	..	..	..	..	..	..	..	..	74.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	75.
×	×	×	×	×	×	×	×	×	×	×	×	×	..	×	..	×	×	×	..	×	×	×	76.
..	×	..	×	×	×	..	..	..	..	..	×	..	..	..	..	..	..	..	..	..	..	..	77.
..	×	..	..	..	..	..	..	..	..	..	×	..	..	..	..	..	..	..	..	..	..	..	78.
..	..	×	..	×	×	..	..	×	..	..	..	..	..	..	..	..	..	..	..	..	..	..	79.
..	..	..	..	×	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	80.
..	×	..	..	×	×	×	..	×	..	..	..	..	..	..	..	..	..	..	..	..	..	..	81.

TABLE SHOWING THE GEOGRAPHICAL DISTRIBUTION IN THE

	List of Species.	Magheralin. 1	Moira. 2	Kilcorrig. 3	White Mountain. 4	Colin Glen. 5	Black Hill. 6	Wolf Hill. 7	Squire's Hill. 8	Cave Hill. 9	Whitewell. 10	Whiteabbey. 11	Woodburn. 12	Whitehead. 13
82.	Polymorphina horrida, *Reuss.*	..	..	..	..	..	..	x	..	x	x	..	x	..
83.	Polymorphina fusiformis, *Romer*	..	..	..	..	x	x	..	..	x	x	x	x	..
84.	Polymorphina regina, *B. P. & J.*, var.	..	..	..	..	..	..	..	..	..	..	..	..	..
85.	Uvigerina nodosa, *D'Orb.*	..	..	..	..	..	..	..	..	..	..	..	..	..
86.	Globigerina cretacea, *D'Orb.*	x	x	..	..	x	x	x	..	x	x	x	x	..
87.	Globigerina bulloides, *D'Orb.*	x	..	..	..	..	..	x	..	..	..	..	..	..
88.	Globigerina bulloides *D'Orb.*, var. nov., heaped	..	..	..	..	..	x	..	..	..	..	..	..	..
89.	Globigerina marginata *(Reuss)*	..	..	..	..	..	..	..	..	x	..	x	x	..
90.	Pullenia quinqueloba *(Reuss)*	x	..	..	..	..	..	..	..	x	x	x	x	x
91.	Textularia gibbosa, *D'Orb.*	.	..	..	..	..	..	..	..	..	..	x	..	..
92.	Textularia pupa, *Reuss.*	x	..	..	x	..	..	..	..	..	..	x	x	..
93.	Textularia sagittula, *Defrance*	x	x	..	x	..	x	..	..	x	x	x	x	x
94.	Textularia trochus, *D'Orb.*	..	..	..	..	..	..	..	..	..	..	..	..	..
95.	Textularia turris, *D'Orb.*	..	..	..	x	..	..	..	..	..	..	..	x	..
96.	Textularia turris, *D'Orb.*, short and thick variety	x	x	..	..	..	x	x	..	x	..	x	x	x
97.	Textularia fœda, *Reuss.*	x	x	..	..	..	..	x	..	x	x	x	x	..
98.	Textularia prælonga, *Reuss.*	..	..	..	x	..	..	..	..	..	..	..	x	..
99.	Textularia globulosa, *Ehr*	x	..	..	..	x	x	..	..	x	x	x	..	x
100.	Vernculina triquetra *(Munster)*	x	..	..	..	..	..	..	..	..	x	x	x	..
101.	Gaudryina rugosa, *D'Orb.*	..	..	..	..	..	..	..	..	..	..	x	x	..
102.	Gaudryina pupoides, *D'Orb.*; var. prælonga, *Reuss*	..	..	..	..	..	..	..	..	..	..	..	x	..
103.	Tritaxia triquetra *(Munster)*	..	x	..	..	..	..	..	..	..	..	..	..	..
104.	Bulimina Presli, *Reuss*	x	..	..	x	..	..	..	..	..	x	x	x	..
105.	Bulimina ovulum, *Reuss*	x	x	x	x	..	x	x	..	x	x	x	x	x
106.	Bulimina brevis, *D'Orb.*	x	x	x	x	x	x	x	..	x	x	x	x	x
107.	Bulimina intermedia, *Reuss.*	..	..	..	..	..	..	..	..	x	..	..	x	..
108.	Bulimina regularis, sp. nov. *Jones, MS.*	..	..	..	..	..	x	..	..	..	..	..	..	..
109.	? Bulimina sp.	x	..	..	..	..	..	..	..	..	..	..	..	..
110.	Virgulina tegulata, *Reuss.* var.	x	..	x	..	x	x	x	..	x	x	x	x	x
111.	Bolivina decorata, sp. nov. *Jones, MS.*	x	x	..	..	..	x	x	..	x	x	x	x	..
112.	Bolivina, sp.	..	..	..	..	..	..	..	..	..	..	..	..	..
113.	Pleurostomella fusiformis, *Reuss.*	x	..	..	..	..	x	x	..	x	x	x	x	..
114.	Planorbulina exsculpta, *Reuss*	x	..	..	..	..	x	x	..	x	x	x	x	x
115.	Planorbulina ammonoides *(Reuss.)*	x	x	x	x	x	x	x	..	x	x	x	x	x
116.	Planorbulina ammonoides *(Reuss)*, var. with extra shell-growth	x	x	x	x	x	x	x	..	x	x	x	x	x
117.	Planorbulina crenulata *(Reuss)*	x	..	..	..	..	x	x	..	x	x	x	x	..
118.	Truncatulina lobatula *(W. & J.)*	x	..	..	x	..	x	x	..	..	..	x	x	..
119.	Pulvinulina Micheliniana *(D'Orb.)*	x	..	x	x	x	..	x	..	x	x	x	x	x
120.	Rotalia orbicularis *(D'Orb.)*, var.	x	x	..	x	..	x	x	..	x	x	x	x	x
121.	Rotalia vel Planorbulina ?, with each chamber symmetrically perforated	..	..	..	..	..	x	..	..	..	..	..	..	..
122.	Ramulina lævis, gen. et sp. nov. *Jones*	..	..	..	..	..	..	..	..	..	..	..	x	..
123.	Ramulina brachiata, sp. nov. *Jones*	..	..	..	..	..	..	..	..	..	..	..	..	..
	SPONGE SPICULA, &c.													
124.	Acerate spiculum. Pl. II., figs. 1 & 2	..	..	..	x	x	..	..	..	x	..	..	..	..
125.	Attenuato-acuate spiculum. Pl. II., fig. 3	x	..	..	..	x	x	x	..	x	x	..	x	..
126.	Moniliform attenuato-acuate spiculum. Pl. II., fig 4	..	..	..	..	..	..	x	..	x	..	x	x	..
127.	Furcated porrecto-ternate moniliform spiculum Pl. II., fig. 5	..	x	..	..	..	x	x	..	x	..	..	..	..

NORTH OF IRELAND OF THE CRETACEOUS MICROZOA—*(Continued)*.

Blackhead.	Near Gobbins.	Ballytober.	Near Mill Bay.	Magheramorne.	S. of Ballycarry.	Redhall Glen.	Glenoe.	Waterloo.	Sallagh Braes.	Glenarm.	Carnlough.	Garron Point.	Glenariff.	Lurigethan.	Trostan Mtn.	Torr Head.	Ballintoy.	White Rocks.	N. of Moneymore	Spring Hill.	Slieve Gallion.	Keady Hill.	
14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
..	..	×	×	×	×	..	×	×	×	..	..	..	..	..	..	..	..	..	..	×	×	×	82.
..	×	×	×	×	×	×	×	..	..	×	×	..	×	..	..	..	..	..	..	..	..	×	83.
..	×	×	×	×	×	..	..	..	..	×	×	..	..	..	..	..	..	..	..	..	..	×	84.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	..	×	×	..	×	×	×	×	85.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	..	×	×	..	×	×	×	×	86.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	..	×	×	..	×	×	×	×	87.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	..	×	×	..	×	×	×	×	88.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	..	×	×	..	×	×	×	×	89.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	..	×	×	..	×	×	×	×	90.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	..	×	×	..	×	×	×	×	91.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	..	×	×	..	×	×	×	×	92.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	..	×	×	..	×	×	×	×	93.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	..	×	×	..	×	×	×	×	94.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	..	×	×	..	×	×	×	×	95.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	96.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	97.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	98.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	99.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	100.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	101.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	102.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	103.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	104.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	105.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	106.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	107.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	108.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	109.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	110.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	111.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	112.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	113.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	114.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	115.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	116.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	117.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	118.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	119.
×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	120.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	121.
..	×	×	..	..	..	..	..	×	..	..	..	..	..	..	×	..	..	..	..	..	..	×	122.
..	×	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	123.
..	..	×	×	×	×	..	..	..	×	×	..	..	..	..	..	..	..	×	..	×	×	×	124.
×	..	..	×	×	×	..	..	..	×	×	..	..	×	×	..	×	×	..	×	×	×	×	125.
×	×	×	×	..	×	..	×	×	×	×	..	..	×	×	×	..	..	..	..	..	..	×	126.
..	..	..	..	..	..	..	..	×	×	..	×	..	×	..	..	..	..	..	..	×	×	×	127.

TABLE SHOWING THE GEOGRAPHICAL DISTRIBUTION IN THE

	List of Species.	Magheralin. 1	Moira. 2	Kilcorrig. 3	White Mountain. 4	Colin Glen. 5	Black Hill. 6	Wolf Hill. 7	Squire's Hill. 8	Cave Hill. 9	Whitewell. 10	Whiteabbey. 11	Woodburn. 12	Whitehead. 13
128.	Equiangular triradiate spiculum. Pl. II., fig. 6	..	..	..	..	..	..	..	..	..	..	..	..	..
129.	Spiculated equiangular triradiate spiculum. Pl. II., fig. 7	..	x	..	x	x	..	x	x	x	x	..	..	..
130.	Incipiently expanso-ternate spiculum. Pl. II., fig. 8	..	..	..	..	..	x	..	..	..	..	..	x	x
131.	Expando-ternate spiculum. Pl. II., figs. 9 & 10	..	..	..	..	..	x	..	..	x	x	..	..	..
132.	Expando-ternate spiculum, with cylindrical radii. Pl. II., figs. 11 & 12	..	..	..	..	..	..	x	..	x	x	..	x	..
133.	Furcated attenuato-patento-ternate spiculum (constricted). Pl. II., fig. 13	..	..	..	..	..	..	x	..	x	..	..	..	..
134.	Furcated attenuato-patento-ternate spiculum. Pl. II., figs. 14 to 16	..	x	..	x	x	x	x	x	x	x	..	x	..
135.	Furcated attenuato-patento-ternate spiculum. Pl. II., fig. 17	x	x	..	..	x	..	x	x	x	x	..	..	x
136.	Furcated attenuato-patento-ternate spiculum. Pl. II., fig. 18	..	x	x	x	..	x	x	x	x	x	..	..	..
137.	Recurvo-ternate spiculum. Pl. II., fig. 19	..	..	..	..	..	..	x	..	x	x	..	..	..
138.	Spiculum. nov. Pl. III., fig. 1	..	..	..	..	x	..	..	..	x	..	..	..	..
139.	Spiculum. Pl. III., figs. 2 & 3	..	..	..	..	..	..	..	..	x	x	..	..	..
140.	Porrecto-ternate spiculum. Pl. II., fig. 20	x	x	..	..	..	..	..	..	x	..	..	..	..
141.	Porrecto-ternate spiculum. Pl. II., fig. 21	..	..	..	..	..	..	..	..	x	..	..	..	..
142.	Porrecto-ternate spiculum Pl. II., fig. 22	..	..	..	x	..	x	..	x	x	..	..	..	..
143.	Attenuated rectangulate hexradiate spiculum. Pl. III., figs. 4 & 5	x	x	..	..	x	x	x	x	x	..	..	..	..
144.	Skeleton fibres. Pl. III., figs 6 & 7	..	..	..	..	..	..	..	..	..	..	..	..	..
145	Skeleton fibres. Pl. III., figs. 8 & 9	..	x	..	x	x	..	x	x	x	x	..	x	..
146.	Skeleton fibres. Pl. III., fig. 10	x	..	..	..	..	..	..	..	x	..	..	..	..
	SPONGE SPICULA.													
147.	Sphero-stellate spiculum. Pl. III., fig. 11	..	..	..	..	..	..	..	..	..	..	..	..	..
148.	Recurvo-dentate quaternate spiculum. Pl. II., fig. 23	..	..	..	..	..	..	..	..	..	..	..	..	..
149.	Spiculum ? Plate III., fig. 12	..	..	..	..	..	..	..	..	..	..	..	..	..
150.	Spiculum ? Plate III., fig. 13	..	..	..	..	..	..	..	x	..	..	..	..	..
	FORAMINIFERA.													
151.	Spiroplecta prælonga, (*Reuss*)	..	..	..	..	..	..	..	..	..	..	..	..	..

NORTH OF IRELAND OF THE CRETACEOUS MICROZOA—*(Continued)*.

Blackhead.	Near Gobbins.	Ballytober.	Near Mill Bay.	Magheramorne.	S. of Ballycarry.	Redhall Glen.	Glenoe.	Waterloo.	Sallagh Braes.	Glenarm.	Carnlough.	Garron Point.	Glenariff.	Lurigethan.	Trostan Mtn.	Torr Head.	Ballintoy.	White Rocks.	N. of Moneymore	Spring Hill.	Slieve Gallion.	Keady Hill.	
14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
..	..	×	..	×	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	..	×	..	128.
×	×	×	..	×	×	×	..	..	×	×	..	..	×	..	..	×	×	×	×	×	×	×	129.
×	×	×	..	..	×	..	×	..	×	..	..	..	×	..	..	×	..	..	..	..	×	..	130.
×	×	×	×	..	×	..	×	..	×	×	×	..	×	×	..	×	×	..	×	×	..	×	131.
..	×	..	×	..	..	..	..	..	×	..	..	..	..	..	×	..	..	..	..	..	×	..	132.
..	..	×	..	..	×	..	..	..	..	×	..	..	..	..	..	×	..	..	..	×	×	..	133.
×	×	×	×	..	×	×	..	×	×	×	..	..	×	..	..	×	×	×	×	×	×	×	134.
×	×	×	×	..	×	..	..	..	×	×	×	..	×	×	..	×	×	..	×	×	×	×	135.
×	×	..	..	..	×	..	..	..	..	×	..	..	×	..	×	×	×	×	×	×	×	×	136.
..	×	..	..	..	..	..	..	..	..	..	×	..	×	..	..	..	..	..	..	..	×	..	137.
..	..	..	..	..	..	..	..	..	×	..	..	..	×	..	..	×	..	..	..	..	..	×	138.
..	×	..	..	..	..	..	..	..	×	..	..	..	×	..	×	..	×	×	..	×	×	×	139.
..	×	..	..	..	..	..	..	..	×	..	..	..	×	..	×	×	..	×	..	..	×	..	140.
..	×	×	..	..	×	..	..	..	×	×	×	..	×	..	..	..	..	..	..	..	×	×	142.
×	×	×	×	..	×	..	..	..	×	×	..	..	×	×	×	×	×	×	×	×	×	×	143.
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	144.
×	×	×	×	..	×	..	..	×	×	×	×	..	×	..	×	..	×	..	×	×	×	×	145.
..	..	×	×	..	×	..	..	..	×	×	..	..	..	..	..	×	×	..	..	×	×	×	146.
..	..	..	..	..	..	..	..	..	×	..	..	..	..	..	..	..	..	..	..	..	..	..	147.
..	..	..	..	..	×	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	148.
..	..	×	..	..	..	×	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	149.
..	×	..	×	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	150.
..	..	..	..	..	×	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	151.

EXPLANATION OF PLATE II.

[The figures in parentheses refer to the numbers in the List of Species.]

Figs. 1, 2 (124) *Acerate spicula.* Springhill, Co. Derry.

,, 3 (125) *Attenuato-acuate spiculum.* Springhill, Co. Derry.

,, 4 (126) *Moniliform attenuato-acuate spiculum.* Springhill, Co. Derry.

,, 5 (127) *Furcated porrecto-ternate moniliform spiculum.* Keady Hill, Co. Derry.

,, 6 (128) *Equiangular triradiate spiculum.* Moira, Co. Down.

,, 7 (129) *Spiculated equiangular triradiate spiculum.* Moira, Co. Down.

,, 8 (130) *Incipiently expanso-ternate spiculum.* Glenariff, Co. Antrim.

,, 9 (131) *Expando-ternate spiculum* (immature). Cave Hill, Co. Antrim.

,, 10 (131) *Expando-ternate spiculum.* Sallagh Braes, Co. Antrim.

,, 11, 12 (132) *Expando-ternate spicula, with cylindrical radii.* Sallagh Braes, Co. Antrim.

,, 13 (133) *Furcated attenuato-patento-ternate spiculum* (constricted). 13 *b. Plane of the radii.* Slieve Gallion, Co. Derry.

,, 14, 15, 16 (134) *Furcated attenuato-patento-ternate spicula.* Sallagh Braes, Co. Antrim.

,, 17 (135) *Furcated attenuato-patento-ternate spiculum.* 17 *b. Plan of the radii.* Springhill, Co. Derry.

,, 18 (136) *Furcated attenuato-patento-ternate spiculum.* Cave Hill, Co. Antrim.

,, 19 (137) *Recurvo-ternate spiculum.* 19 *b. Plane of the radii.* Sallagh Braes, Co. Antrim.

,, 20 (140) *Porrecto-ternate spiculum.* Torr Head, Co. Antrim.

,, 21 (141) *Porrecto-ternate spiculum.* Sallagh Braes, Co. Antrim.

,, 22 (142) *Porrecto-ternate spiculum.* Sallagh Braes, Co. Antrim.

,, 23 (148) *Recurvo-dentate quaternate spiculum.* 23 *b. Plane of the radii.* South of Ballycarry Station, Co. Antrim.

The figures are all enlarged—the line at the side of each indicates the natural size.

EXPLANATION OF PLATE III.

[The figures in parentheses refer to the numbers in the List of Species.]

Fig. 1 (138) *Spiculum*—new. 1 *b*. *Side view.* Keady Hill, Co. Derry.

,, 2, 3 (139) *Spicula.* 2 *b*, 3 *b*. *Side views.* Sallagh Braes, Co. Antrim.

,, 4 (143) *Attenuated-rectangulate hexradiate spiculum.* Springhill, Co. Derry.

,, 5 (143) *Attenuated-rectangulate hexradiate spiculum.* Ballytober, Co. Antrim.

,, 6 (144) *Fragment of Skeleton fibre.* Sallagh Braes, Co. Antrim.

,, 7 (144) *Fragment of Skeleton fibre, same as the preceding one, front view.* South of Ballycarry Station, Co. Antrim.

,, 8 (145) *Fragment of Skeleton fibre.* Sallagh Braes, Co. Antrim.

,, 9 (145) *Fragment of Skeleton fibre.* Keady Hill, Co. Derry.

,, 10 (146) *Fragment of Skeleton fibre.* Ballintry, Co. Antrim.

,, 11 (147) *Sphero-stellate spiculum.* Sallagh Braes, Co. Antrim.

,, 12 (149) *Spiculum?* 12 *b*. *Side view.* Ballytober, Co. Antrim.

,, 13 (150) *Spiculum?* South of Ballycarry Station, Co. Antrim.

,, 14, 15 (82) *Polymorphina horrida*, Reuss. Near the Gobbins, Co. Antrim.

,, 16 (81) *Polymorphina damæcornis*, Reuss. 16 *b*. *Upper surface.* South of Ballycarry Station, Co. Antrim.

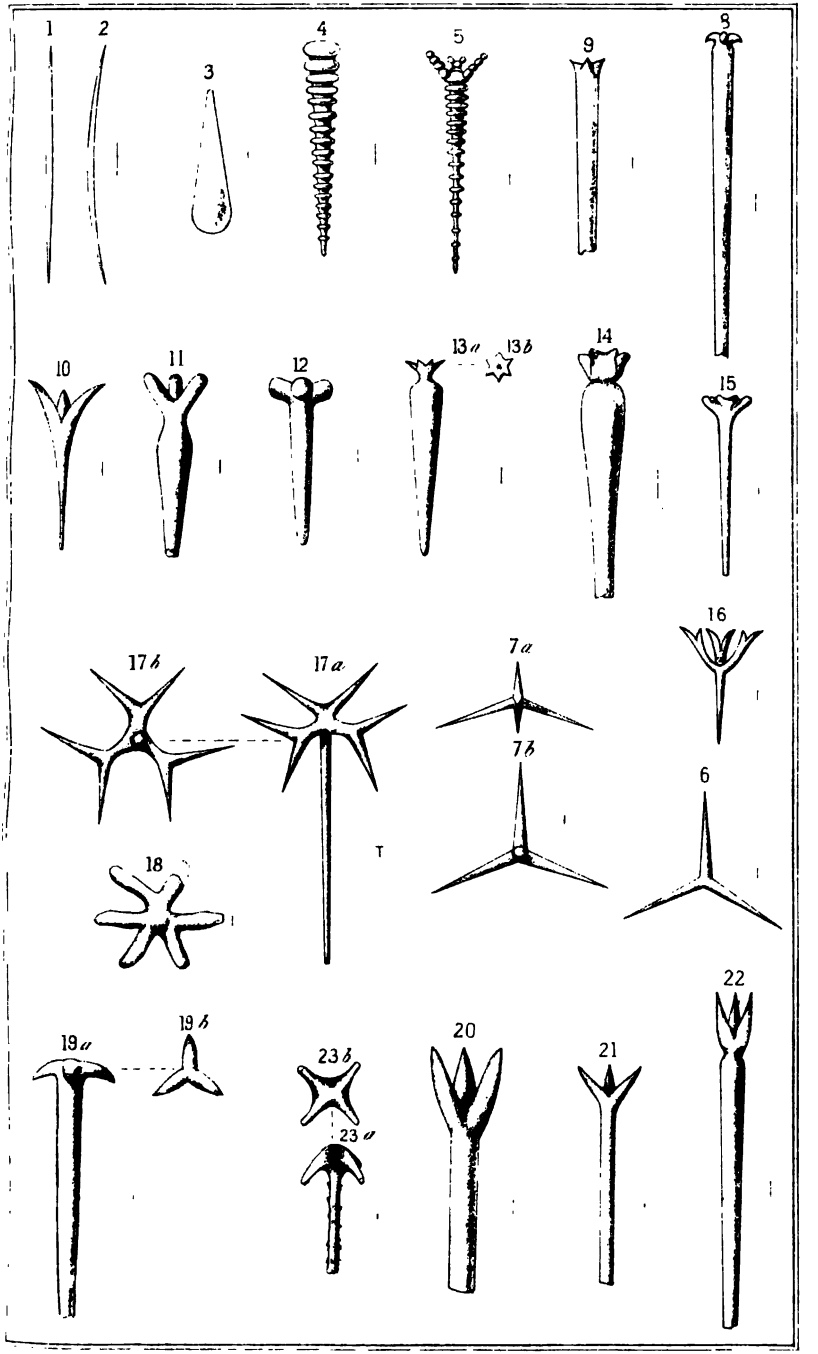
,, 17 (81) *Polymorphina damæcarnis*, Reuss. Near the Gobbins, Co. Antrim.

,, 18 (121) *Rotalia* vel *Planorbulina? With each chamber symmetrically perforated.* Black Hill, Co. Antrim.

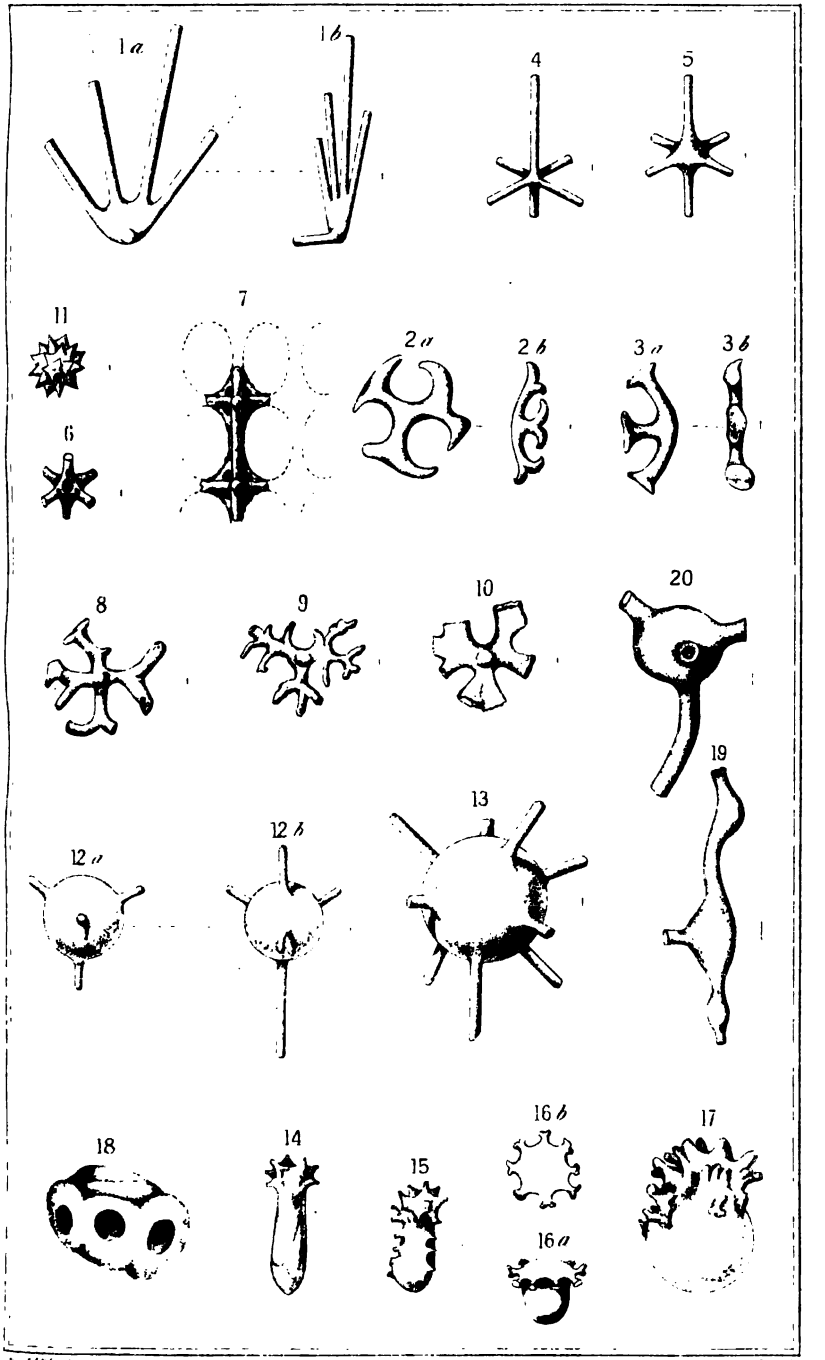
,, 19 (122) *Ramulina lævis*, gen. et sp. nov. Jones. Sallagh Braes, Co. Antrim.

,, 20 (123) *Ramulina brachiata*, sp. nov. Jones. Keady Hill, Co. Derry.

The figures are all enlarged—the line at the side of each indicates the natural size.



WRIGHT — IRISH CRETACEOUS MICROZOA.


1a
1b
4
5
11
7
2a
2b
3a
3b
6
8
9
10
20
19
12a
12b
13
18
14
15
16b
16a
17

APPENDIX IV.

RECENT

Foraminifera of Down and Antrim,

BY

JOSEPH WRIGHT, F.G.S.,

Hon. Assoc. of the Belfast Nat. Hist. and Phil. Soc.

CORRELATION

OF THE

SILURIAN ROCKS OF THE CO. DOWN,

BY

WILLIAM SWANSTON, F.G.S.,

Hon. Assoc. of the Belfast Nat. Hist. and Phil. Soc.,

AND

CHARLES LAPWORTH, F.G.S.

PUBLISHED BY
THE BELFAST NATURALISTS' FIELD CLUB.

[*Proceedings Belfast Naturalists' Field Club—Appendix, 1876-77.*]

RECENT FORAMINIFERA OF DOWN AND ANTRIM.

By JOSEPH WRIGHT, F.G.S.

NOTWITHSTANDING the many fine bays and loughs which indent our coast, and the facility thus afforded for studying our recent Foraminifera, the subject has hitherto received but little attention from Irish naturalists. In the year 1858 Prof. Williamson published his Monograph on the recent British Foraminifera (1), and through its pages are frequent references to species found in Ireland. Most of these were collected by the late George C. Hyndman, in Carnlough Bay. The year previous to this a series of dredgings had been taken in Belfast Lough, under the auspices of the British Association; the fine material thus obtained was examined by Prof. Williamson, and yielded 24 species of Foraminifera.

In 1864 a paper was read by Dr. Alcock before the Lit. and Phil. Soc., Manchester, on Natural History Specimens from Connemara. (2.) It included a very instructive and complete list of Foraminifera, numbering no less than 60 species. They were all collected from shore sand, and one locality, viz., Dog's Bay, Roundstone, Connemara. From these three sources we have a list of 65 species, and they comprise all that was known of Irish Foraminifera up to 1875. (3.)

In the autumn of 1875 a number of the Belfast naturalists joined Mr. Thomas Workman, in his yacht Denburn, for the purpose of dredging in Belfast Lough and waters adjacent; and thus commenced a series of dredging

(1.) Recent Foraminifera of Great Britain, 1858.

(2.) Proc. Lit. and Phil. Soc., Manchester, Vol. IV., No. 15. Session 1864-5, p. 192.

(3.) In Thompson's Natural History of Ireland a list of 31 Foraminifera are given, but as in several of these it is uncertain what species were meant, no notice is taken of them in the above estimate.

operations which have been the means of adding considerably to our knowledge of the Foraminifera around our coast. Gatherings have been taken at 29 stations; 7 of these were from Strangford Lough, and the remainder from Belfast Lough and Channel outside; 6 were from between tides, the others were from depths varying from 4 to 72 fms., the greatest depths attained being in the vicinity of the Maiden Lighthouses. Strangford Lough was dredged in company with Mr. S. A. Stewart, F.B.S.E.; the others with Mr. Wm. Swanston, F.G.S., to whose hearty co-operation much of the success attending these excursions is due. Already 110 species have been found, or about 65 per cent. of our British forms. All of these, with the exception of *Lagena striato-punctata*, occur in Belfast Lough and waters outside, and 95 in Strangford Lough.

I have also examined 9 shore gatherings from various places round our N.E. coast; these have been contributed by Mr. Wm. Gray, M.R.I.A. They have been collected with great care from rich foraminiferal sand (see note on table appended). The results of the examination of these gatherings is given in the first nine columns of Table lettered A to I.

Strangford Lough is a fine landlocked bay, 21 miles long by about 5 to 7 miles wide, and connected with the sea by a narrow channel 8 miles long, through which the tides rush in and out furiously. The lough is studded over with innumerable islands and sunken rocks, the depths being very variable, in parts attaining 30 to 35 fms. Its waters abound in marine life, especially starfishes, the dredges frequently coming up quite choked with them. The Foraminifera, though not so numerous in species as in Belfast Lough, are usually of finer proportions, more especially the *Miliolida*, which are unusually large and numerous. At the upper end of the lough the water becomes more or less brackish, as may be inferred from the occurrence of the brackish water forms, *Trochammina inflata*, and *macrescens*, *Quinqueloculina fusca*, and *Polystomella striato-punctata*, in shore gatherings taken at Greyabbey and Newtownards.

Belfast Lough being more convenient for operations than Strangford Lough has been better examined; the water is shallow throughout, but gets gradually deeper as we near its mouth. From White Head on its northern entrance to Orlock Point on its southern side, the greatest depth is 9 to 10 fms., the deepest parts being near the northern shore; and this continues also to be the case outside the lough. Three miles off the Gobbins, a bold headland situated three miles N.E. of White Head, the water attains a depth of 60 to 70 fms., and in the vicinity of the Maiden Lighthouses 70 to 100 fms. Here, however, the bottom is rocky, and yields little or no fine material. The tides all round the coast run with great violence. Too much stress cannot be laid on the necessity

of selecting slack tides for dredging these parts, as otherwise the operations are certain to end in disappointment and failure.

A table is appended of the stations from which the various gatherings were taken, with particulars of bathymetrical range, nature of sea bottom, weight of material brought up, and number of species found. As the quantity of material dredged varied greatly at different stations, it appeared desirable to record the weight collected at each place, so as to arrive at a correct estimate of the relative abundance of foraminiferal life at the various places. (1.)

To my friend Mr. Henry B. Brady, F.R.S., I am deeply indebted for the kind assistance he has rendered me in the critical examination of the doubtful species; and likewise to my friend Mr. William Swanston, F.G.S., for the accurate and artistic drawings in the plate which accompanies this memoir.

The following Foraminifera deserve a passing notice, viz.:—

BILOCULINA RINGENS, (*Lamk.*).

Generally distributed at various depths. A variety of this species is not uncommon in deep water, small in size, and in contour approaching *B. sphæra*.

TRILOCULINA OBLONGA, (*Montagu*).

Very abundant in Strangford Lough, where the specimens are large and typical; in Belfast Lough it is rare, and the specimens usually small.

LITUOLA GLOBIGERINIFORMIS, *P. and J.*

Not unfrequent in Belfast Lough and Strangford Lough; and it also occurs plentifully in Cork Harbour and Kinsale Harbour.

LAGENA SULCATA, *W. and J.*

The costæ on this species are sharply defined, about every alternate one extending up the neck, round which they are usually somewhat twisted.

LAGENA COSTATA, (*Will.*).

This species differs from the last in being entosolenian; in full-grown examples the shell is spherical, with the costæ slightly raised and very regular, extending to near the neck, where they usually end abruptly, the remainder being smooth, as is also the neck, which is short. The texture of the shell is more glassy than in *L. sulcata*. Williamson's figure represents a young speci-

(1.) A very ingenious dredge has been constructed by Mr. David Robertson, F.G.S., of Glasgow. It dips deep into the bottom and fills quickly. It has an advantage over the ordinary dredges in this respect, as each haul brings up a very uniform quantity of the sea bottom. See notes on the recent Foraminifera and Ostracoda of the Firth of Clyde, by David Robertson, F.G.S.—Trans. Geol. Soc. of Glasgow, Vol. V., Part I., p. 112.

men; in this state it has no neck, the shell is thin and sufficiently transparent to show the internal tube.

LAGENA WILLIAMSONI, (*Alcock*).

This form differs from *Lagena costata*, to which it is closely allied, in being smaller in size, less spherical in shape, and the sulci more sharply defined Its chief peculiarity, however, is in the neck, which is short, and formed of two distinct portions—the first directly continuous with the body, and ornamented with two or three rows of hexagonal reticulations; the second a small cylindrical tube, continued from the centre of it. This form is abundant everywhere round our coast, and common in the Estuarine Clay at Magheramorne, County Antrim.

LAGENA STRIATO-PUNCTATA, *P. and J.*

A few examples of this *Lagena* were met with in Strangford Lough; one specimen was also found in Cork Harbour. Abundant in the Estuarine Clay at Magheramorne, County Antrim (1).

LAGENA HISPIDA, *Reuss.*

Ovate, surface covered with numerous blunt spines having a tendency to run into one another in longitudinal rows; a very rare species, only a few examples having been found. It is new to Britain.

LAGENA JEFFREYSII, *Brady.*

Only one example found; transverse section round. Mr. H. B. Brady, F.R.S., informs me "that the species is usually slightly quadrate in transverse contour, but sometimes quite round; is always slightly aculeate; the aculei quite spinous and pointed, very numerous and minute, and the neck commonly with spiral ornamentation. It often has to be washed with hot solution of some alkali to get the encrusting dirt off, as it seems without this a mere rough form that catches dirt."

LAGENA TRIGONO-MARGINATA, *P. and J.*

A three-sided form of *Lagena marginata*. Very rare.

LAGENA OBLONGA, (*Seguenza*).

A three-sided form of *Lagena lucida*. Very rare. A few examples have been found in the Estuarine Clay at Magheramorne, County Antrim.

(1.) I am indebted to my friend Prof. T. Rupert Jones, F.R.S., for his opinion on this *Lagena* and for some of the other Foraminera given in this list.

VAGINULINA LEGUMEN, (*Linn.*).

Large and abundant in the deep water of Strangford Lough.

VAGINULINA LINEARIS, (*Montagu*).

Large and abundant in the deep water in the vicinity of the Maiden Lighthouses.

TINOPORUS LUCIDUS, *Brady MS.*

Generally distributed, but usually occurring in a very fragmentary state. Living specimens were found in the deep water in Strangford Lough, as also in the vicinity of the Maiden Lighthouses. This species is abundant in Dog's Bay, Connemara; it also occurs in Kinsale Harbour, and Cork Harbour. A few examples have been met with in the Estuarine Clay, Magheramorne, County Antrim.

DISCORBINA PARISIENSIS, (*D'Orb.*).

This species has not hitherto been recorded as British. It was first found in shore sand near Greyabbey, Strangford Lough; spire depressed, and exhibiting in fine state the characteristic dotted lines on the inferior surface. It has since been found in abundance in several of the shallow water gatherings in Belfast Lough, the specimens being usually more conical than those from Greyabbey (see figs 2*a*, 2*b*). It has been also found in Kinsale Harbour, and occurs, fossil, in the Estuarine Clay at Magheramorne, County Antrim. Mr. H. B. Brady writes me with reference to this species:—"The specimens of *Discorbina parisiensis* are all very minute, and they vary considerably in contour, some having the thin sharp edge, and low conical figure of D'Orbigny's Models, whilst others are round-edged and thicker; all have the characteristic striation of the inferior surface. The latter variety approximates closely to the characters of *D. obtusa*, and suggests the near relationship of the two forms. It should be observed that *D. parisiensis* has been obtained of the Rev. A. M. Norman, in dredgings from the North Atlantic, whilst *D. obtusa* is not only of frequent occurrence in the Arctic Seas, but has been found on our own shores."

EXPLANATION OF PLATE IV.

Fig. 1. *Discorbina parisiensis*, (D'Orb.). 1 *a*, upper surface; 1 *b*, lower surface; 1 *c*, edge view, x 60, diam.; 1 *d*, fragment of lower surface, showing structure, greatly enlarged. Shore sand, Greyabbey, Strangford Lough, County Down.

„ 2. *Discorbina parisiensis*, (D'Orb.). 2 *a*, upper surface; 2 *b*, lower surface; 2 *c*, edge view; x 60 diam. Off Grey Point, 6 fms.

„ 3. *Trochammina gordialis*, P. and J. x 60 diam. Off Black Head, 20 fms.

„ 4. *Tinoporus lucidus*, Brady MS. 4 *a*, upper surface; 4 *b*, edge view; x 40 diam. White Knowe, Strangford Lough, 6 fms.

„ 5. *Tinoporus lucidus*, Brady MS. Encrusting a stem of polyzoan; x 30 diam. Off Maiden Lighthouses, 60 fms.

„ 6. *Lituola globigeriniformis*, P. and J. x 60 diam. Off Maiden Lighthouses, 60 fms.

„ 7. *Lagena hispida*, Reuss. x 60 diam. Off Black Head, 18 fms.

„ 8. *Lagena trigono-marginata*, P. and J. 8 *a*, side view; 8 *b*, end view showing aperture; x 60 diam. Off White Head, 7 fms.

„ 9. *Lagena oblonga*, (Seguenza). 9 *a*, side view; 9 *b*, end view, showing aperture; x 60 diam. Off White Head, 10 fms.

„ 10. *Lagena sulcata*, W. and J. x 60 diam. Off Black Head, 18 fms.

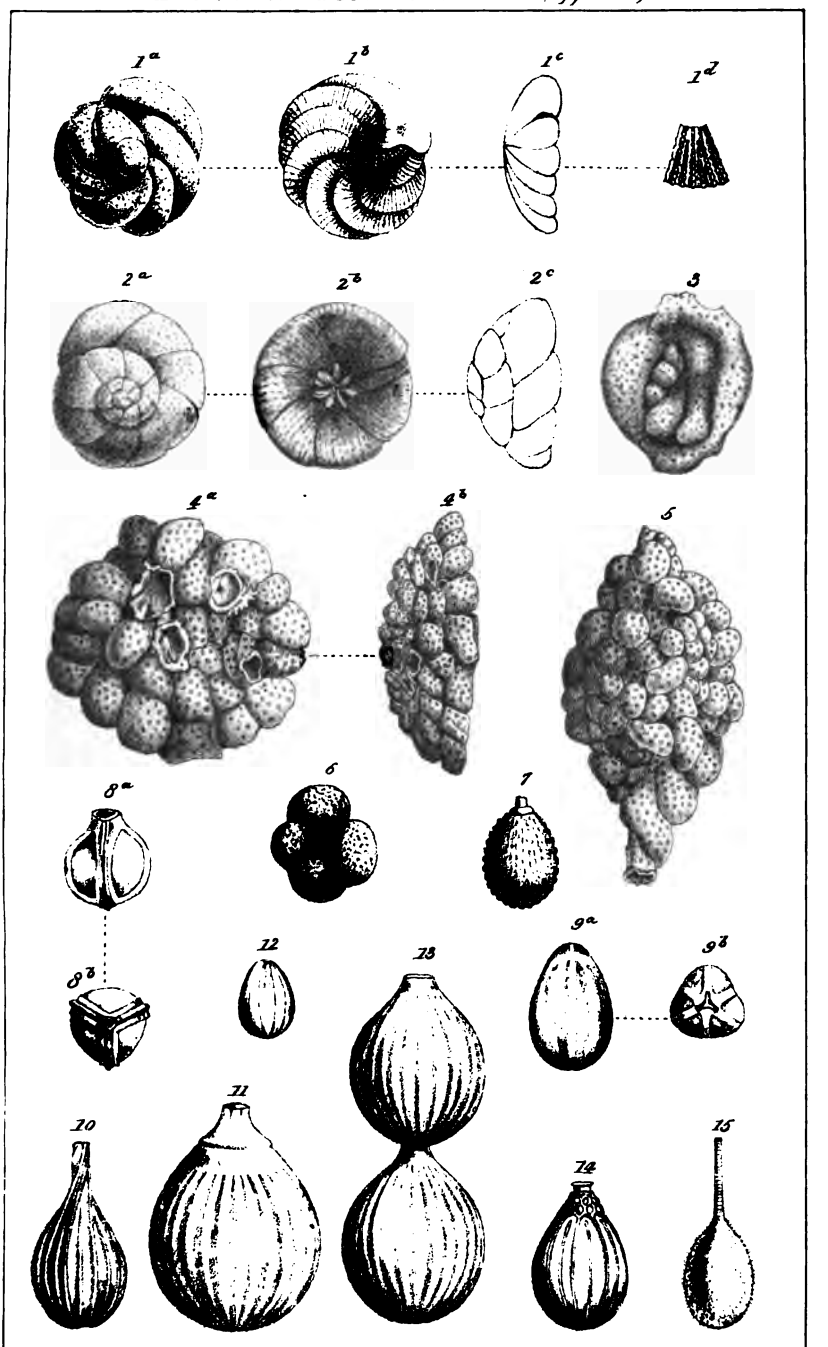
„ 11. *Lagena costata*, (Will.). x 60 diam. Off Black Head, 18 fms.

„ 12. *Lagena costata*, (Will.). A young specimen, x 60 diam. Off Maiden Lighthouses, 60 fms.

„ 13. *Lagena costata*, (Will.). Bilocular, x 60 diam. Off Orlock Point, 11 fms.

„ 14. *Lagena Williamsoni*, (Alcock). x 60 diam. Off White Knowe, Strangford Lough, 6 to 8 fms.

„ 15. *Lagena Jeffreysii*, Brady. x 60 diam. Off Maiden Lighthouses, 62 fms.



W. GWANSTON DEL WRIGHT—FORAMINIFERA OF DOWN AND ANTRIM ARCHER & SONS. LITH

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...		r	r	...	r	...	...	r	r	r	vr	...		72
c		vc	vc	c	c	..	r	c	c	r	c	r		73
vc														
...		vc	c	c	c	...	...	r	c	c	r	r		74
...		c	c	vr	c	...	...	...	...	...	...	...		75
...		c	c	...	c	..	...	...	...	...	...	...		76
...		r	r	c	r	...	...	c	vc	c	c	c		77
...		...	...	...	...	...	...	r	..	...	...	...		78
		r	r	c	r	...	...	r	...	...	r	...		79
...		r	...	...	...	...	vr	c	r	c	c	r		80
vr														
...		r	r	vr	..	...	..	c	c	r	c	r		81
...		r	r	vr	r	...	...	r	r	...	r	r		82
...		c	c	r	c	...	...	r	r	...	r	...		83
		..	...	...	..	.	...	r	r	...	vr	...		84
..														
		...	...	...	...	...	...	r	r	...	c	...		85
..														
...		r	r	...	...	...	...	r	r	...	c	...		86
		r	r	..	...	...	r	r	...	r	r	...		87
vr														
.		r	r	c	r	...	...	r	...	...	r	...		88
		c	c	c	c	...	..	r	vr	...	r	...		89
...														
...		r	r	...	r	...	...	r	r	c	r	c		90
...		...	...	r	...	...	c	vr	vr	...	...	...		91
vc		r	r	vc	...	...	...	r	r	r	vr	r		92
		vc	c	r	vc	...	r	c	c	c	c	c		93
c														
		r	r	c	c	...	...	c	c	c	r	r		94
vc														
...		c	c	c	r	...	..	c	c	c	r	c		95
	c	vc	vc	...	vc	...	...	...	...	...	...	...		96
...														
vr		vc	...	r	vc	...	...	...	...	...	...	...		97
		r	r	...	r	...	...	...	...	...	...	...		98
c														
r		r	c	c	r	...	r	vc	c	c	vc	c		99
		c	c	c	r	...	...	c	c	c	c	c		100
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c		...	...	...	vr	...	...	...	...	...	...	vr		101
		vr	vr	r	vr	...	..	vr	r	r	...	vr		102
...		r	r	r	...	r	c	c	r	r	c	r		103
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vc														
c		r	r	c	r	...	c	c	c	r	c	c		105
		r	c	r	c	vc	vc	c	r	r	c	r		106
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c		vr	vr	...	r	...	...	...	...	...	vr	...		107
...		c	vc	c	c	...	r	c	c	r	c	c		108
...		vr	...	...	vr	...	...	vr	...	...	...	...		109
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d shells; material examined, 5 lbs. 4 oz. The dredgings
rarest British species. An example of Lagena striato-

[*Proceedings Belfast Naturalists' Field Club—Appendix*, 1876-77.]

ON THE SILURIAN ROCKS OF THE COUNTY DOWN.

PART I.—CORRELATION.

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INTRODUCTION.

In a paper which I had the honour of reading before the Club in March, 1875, I endeavoured to give some particulars of a series of fossils which I had obtained from the Silurian rocks of the County Down. At that time I had succeeded in procuring them from only one locality—Coalpit Bay, near Donaghadee.—and the results did not exceed fifteen species. Further research in the same locality, and a more extended examination of the district, have been rewarded by a large addition to the list, affording better evidence than has hitherto been available for determining the geological position of the rocks in which they are found.

The Silurian rocks of County Down form part of an area which is rudely triangular in form. A line drawn from Grey Point on the shore of Belfast Lough in a south-westerly direction through Holywood, along the valley of the Lagan, by Lisburn and Waringstown, would mark its north-western boundary. The Irish Sea bounds it on the east, and to the south the Carboniferous limestone forms the base of the figure by an irregular line running westward from Drogheda. It comprises the greater parts of the Counties of Down, Armagh, Monaghan, Louth, Meath, and Cavan. The district is an agricultural one, its surface of an undulating or hillocky character, possessing few elevations deserving the title of mountains, the granitic areas of Mourne, Carlingford, and Ballynahinch being excepted. It is not intended in the present paper to

do more than notice the rocks which occupy the north-eastern portion of the area situated wholly in the County Down.

PREVIOUS NOTICES OF THE DISTRICT.

Perhaps the earliest reference to the rocks of this area is that by Drs. Berger and Conybeare, made in 1816. (1) These pioneers of Irish Geology pointed out the similarity between the County Down rocks and those of South Scotland. On the large geological map compiled by Sir Richard Griffith in 1839 the area is put down as Clay-slate or Greywacke-slate belonging to the Transition series. Dr. Bryce in 1852 stated as follows (2):—"The County Down contained two granitic tracts which seem to have been elevated at different epochs. They are separated from one another, and each is wholly enclosed by a thick band of metamorphic slate, gneissose in its lower part, and passing upwards into flinty and common clay-slate. Superimposed conformably upon these are other slates of less crystalline type, whose aggregate thickness is enormous, and whose upper portions have yielded a few imperfect fossils, which seem to make them referable to the Lower Silurian Group; but as yet no definite line has been made out to justify a classification." Sir Roderic Murchison states in 1854 (3):—"It is believed that the Schists of Down are of the same age as the Graptolitic Schists of Wigton and Galloway." J. Beete Jukes, F.R.S., after referring to the Chair of Kildare, which contains Bala fossils (4), states that "another great tract of apparently similar beds stretches from the centre of Ireland, Cavan, &c., to the coast of Down. Among these, however, a portion certainly belongs to the Llandeilo Flags, as near Bellewstown, on the confines of Dublin and Meath, an assemblage of Llandeilo fossils were found."

Many years ago it was known to members of the Club that Graptolites occurred in the County Down, and specimens were obtained by them at Tullygarvan, near Saintfield, from the debris of a shaft which was there sunk in the Silurian rocks in search for coals (5); none were, however, sufficiently perfect for identification.

(1). Transactions of the Geological Society of London, Vol. III.

(2). Report of the British Association (1852).

(3). Siluria (1854)—foot note, p. 166.

(4). Manual of Geology (1862), p. 454.

(5). The slightest knowledge of the evidence furnished by these fossils would have saved a vast amount of useless expenditure and misdirected efforts here, and at many other localities throughout the district. The projectors in their search for coals were doubtless misled by the resemblance of the black Graptolitic bands to the rich carbonaceous shales of the Coal Measures.

The Geological Survey in its progress northward has almost completed the mapping of this area. The maps of the County Down were published in 1871-72 (1). The Silurians are either set down on them in general terms as Lower Silurian, or areas indicated by letters but whose boundaries are often undefined, are assigned to the Bala or Caradoc, and to the Llandeilo. In their examinations of the rocks several fossil localities were discovered which had hitherto been overlooked, and in the "Explanatory Memoirs" lists of species were published from time to time (2).

The want of precision throughout the foregoing notices is no doubt due to the highly disturbed nature of the strata and comparatively uniform lithological character of the rocks, making the determination of their stratigraphical relations a matter of very great difficulty. This difficulty was much enhanced by the absence, until very recently, of fossil evidence sufficient to allow their correlation with other deposits.

LITHOLOGICAL CHARACTER OF THE ROCKS OF THE DISTRICT.

Lithologically the rocks consist for the greater part of grey and purple grits—occasionally conglomeritic—pale grey or greenish slates and flags, and a few widely separated bands of black shales. The latter, though forming but a small portion of the entire rocks here exposed, constitute a group which will claim most attention in the following brief notice. In them are found all the fossils which are enumerated in the accompanying table, and it is from a careful study of their fossil contents that we are enabled to arrive at an estimate of their geological position, and that of the barren grits and slates associated with them. The usual dip of the rocks is to the south-east and south, at angles varying from 30° to vertical. Their continuity is much disturbed by faults and contortions, and their upturned edges, where exposed, bear evidence of having suffered much from denundation. Almost the entire rocks of the area are obscured by drift, and with the exception of the coast-line, few good sections can be seen. The grey and purple grits have not as yet yielded any fossil remains, and it is only within the past few months that they have been detected in the grey slates, a notice of which will be given further on.

(1). Geological Survey of Ireland, maps 29, 36, 37, 38, 47, 48 and 49.

(2). Explanatory Memoirs, accompanying maps 37, 38, 29, 48, 49, 50, and 61.

FOSSIL LOCALITIES.

TIEVESHILLY.—About two miles south of Portaferry, and a short distance east of the bridge on the main road over Carstown Burn, are several quarries formerly worked for roofing-slate. The quarries are low lying, and in winter are filled with water. In dry seasons, however, the rock can be reached, and proves to be thin fissile slates and flags, varying in colour from almost black to pale greenish gray: the dip is nearly vertical, and they have the usual strike of about N.E. and S.W. The dark bands are very fossiliferous, and many of the fossils are beautifully preserved; fifteen species have been obtained from this locality, all, with the exception of one crustacean, belonging to the Graptolitidæ.

COALPIT BAY.(1)—This locality is situated on the shore, about three-quarters of a mile south of Donaghadee, and is only accessible when the tide is low. As it is the best exposure of these fossil-bearing rocks, a more detailed account of it is here given.

A series of massive grey grits and slates occur to the southward of the little bay, dipping at high angles to the south, and terminating northward in a low escarpment. At their base we find the following rocks, upon which they apparently rest conformably:—

1. Massive black slates, with several light-coloured clay bands; the slates containing, among others, the following characteristic fossils:—

RASTRITES PEREGRINUS, *var.* HYBRIDUS, *Lapw.*	MONOGRAPTUS TENUIS, *Portl.*
MONOGRAPTUS SEDGWICKII, *Portl.*	,, LOBIFERUS, *M'Coy.*
,, INTERMEDIUS, *var.* PROTEUS, *Barr.*	DIPLOGRAPTUS HUGHESII, *Nich.*
	,, SINUATUS, *Nich.*
	,, TAMARISCUS, *Nich.*

CEPHALOGRAPTUS (DIPLOGRAPTUS) COMETA, *Geinitz.* - - 10 feet.

2. Dark green mudstones, with several bands, each from two to four inches thick, of buff and light purple clays—unfossiferous—35 feet.

(1). So named from a futile attempt to find coals in the black Graptolitic slates here exposed.

3. Massive black slates and shales rich in fossils; the following are a few of the most characteristic :—

RASTRITES PEREGRINUS, *Barr.*
MONOGRAPTUS GREGARIUS, *Lapw.*
,, CONCINNUS, *Lapw.*
,, SANDERSONI, *Lapw.*
,, TRIANGULATUS, *Harkn.*
,, SPIRALIS, *var.* FIMBRIATUS, *Nich.*
DIPLOGRAPTUS FOLIUM, *His.*
,, TAMARISCUS, *Nich.*
,, VESICULOSUS, *Nich.*
DIMORPHOGRAPTUS ELONGATUS, *Lapw.*
DISCINOCARIS BROWNIANA, *Woodw.*
DAWSONIA CAMPANULATA, *Nich.*

This area is considerably covered with shingle and sand, and the rocks are intersected by several faults carrying them to the north-east; their thickness may be set down at about - - - - - 100 feet.

4. A dyke composed of pale grey finely crystalline calcareous rock running easterly (1) - - - - - 6 feet.

5. Pale grey and greenish mudstones, greatly shattered and unfossiliferous. - - - - - about 65 feet.

Near the base of these mudstones is a thin band of black shale greatly crushed, in which no fossils have yet been detected, but higher up in the mudstones a fragment of black shale, about two feet in diameter and several inches thick was found containing well-marked specimens of *Dicellograptus Forchammeri*, Geinitz.

6. Black shales highly indurated and containing numerous flinty bands, and nodules and veins of iron pyrites. The less altered portions are rich in fossils and have yielded the following :—

CLIMACOGRAPTUS TRICORNIS, *Carr.*
,, CŒLATUS, *Lapw.*
,, BICORNIS, *var.* PELTIFER, *Lapw.*
DICELLOGRAPTUS ELEGANS, *Carr.*
DICRANOGRAPTUS FORMOSUS, *Hopk.*
DICRANOGRAPTUS ZIC ZAC, *var.* MINNIMUS, *Lapw.*
ACROTRETA NICHOLSONI, *Dav.*
ACROTHELE GRANULATA, *Linrs.*

These shales are too much shattered and crumpled to allow of their thickness being exactly estimated. It may, however, be roughly put down at about 50 feet. They form the ridge of a sharp anticlinal, which has for its axis

(1). Geological Survey of Ireland—Explanatory memoir to sheets 37, 38, & 29. p. 31.

another series of mudstones somewhat resembling those noted in paragraph 5 of this section. The succeeding rocks in order, still going northward, are a repetition of the mudstones noted in paragraph 5, partially hidden by sand. No rocks are now seen for about 60 feet, and a fault here breaks the continuity of the section, the next beds exposed being—

7. Black fissile shales and slates dipping S. 20 E. at 75°. These suddenly curve over to the opposite direction, and a few feet further north regain their original dip.

The section is again lost for several hundred feet, and the next rock exposed is massive grey grits and slates, similar to those on the south side of the bay, and having the normal dip of the rocks of the district.

TULLYGARVAN.—This fossil locality is situated about one and a half miles east of Ballygowan Railway station (Belfast and County Down Railway), in the bed of a small stream which flows eastward through the grounds of Tullygarvan House. The rocks near to the shaft which was sunk in search for coals are of a black carbonaceous character, greatly contorted, and much stained with iron. No fossils have yet been detected in them; but judging from the few traces obtained from the debris of the sinking, and from the character of their associated mud-stones, they seem to correspond with those in the axis of the anticlinal at Coalpit Bay. Black-slates are exposed further up the stream in several places, yielding in all seven species of Graptolites, referable to the beds described in paragraph 3 of the same locality; thus pointing to the probability that the rocks here shewn are the westerly extension of those beds.

ORLOCK POINT.—On the shore to the north-east of the coastguard station, black and red shales are exposed between tide marks for about 200 yards. They are bounded on the north and south by purple slates, dipping S. 20 E. at angles varying from 40° to vertical. It is impossible, however, to arrive at the order of occurrence of the black and red shales here exposed, as they are much disturbed by minor faults cutting through them in various directions. The continuity of the section is also broken by a dyke of fine grained Elvanite 10 feet wide, running from west to east, almost in the direction of the strike of the rocks. This dyke undoubtedly occupies the line of a more important fault as we find the rocks on the south side of it consist of black flinty shales, while to the north these are replaced by brown and purple arenaceous beds which pass

up into the prevailing purple and grey slates of the district. Graptolites have been found in the less altered portions of the black shales, they are, however, very indistinct, and only two species—*Leptograptus flaccidus*, Hall, and *Diplograptus truncatus*, Lapw.=*pristis*, His.—could with certainty be made out. In a thin pale grey arenaceous band associated with them occur plant remains, which have been identified as belonging to the genus *Buthotrephis*, but apparently of a species not hitherto figured.

CARNALEA.—On the shore north of Carnalea Railway Station (Belfast, Holywood and Bangor Railway) just where a small stream flows into the Lough, there is a small exposure of black shales almost vertical. To the south-east they abut against grey slates and grits, and seaward they are covered with shingle and sand. These black shales are rich in fossils, but from the shivery nature of the beds they are usually in a fragmentary state. Among the most characteristic are the following :—

DIPLOGRAPTUS TRUNCATUS, *Lapw.*
,, QUADRIMUCRONATUS, *Hall.*
LASIOGRAPTUS HARKNESSI, *Nich.*
RETIOLITES FIBRATUS, *Lapw.*
DICELLOGRAPTUS FORCHAMMERI, *Geinitz.*
,, ELEGANS, *Carr.*
LEPTOGRAPTUS FLACCIDUS, *Hall.*
CLIMACOGRAPTUS TUBULIFERUS, *Lapw.*

CRAWFORDSBURN.—Immediately opposite Crawfordsburn House, on the shore near low water mark, grey mudstones and black shales occur, the general strike of which is N. 20 E. In one place, however, the beds are broken sharply across, bent in a direction exactly at right angles to it, and in part inverted. Fossils are few and fragmentary.

BALLYGROT.—This locality, named from the townland in which it occurs, is near Grey Point, and is also situated on the shore. The rocks consist of a series of pale green mudstones and black shales, which are again followed by a band of grit and an exposure of several hundred feet of black ferruginous shales, containing flinty bands, and which are much threaded with quartz. Faulted against these to the north is a series of purple and grey shales, which are again followed by black shales similar in character to last. Irregularly bedded grits and slates succeed these, and prevail for a considerable distance. No fossils have been detected in the grey or purple shales, but the less altered

portions of the black ferruginous bands are exceedingly rich, and have yielded a large series, among which are the following :—

DIPLOGRAPTUS TRICORNIS, *Carr.*
,, ANGUSTIFOLIUS, *Hall.*
GLOSSOGRAPTUS HINCKSII, *Nick.*
CLATHOGRAPTUS CUNEIFORMIS, *Lapw.*
CLIMACOGRAPTUS SCHARENBERGI, *Lapw.*
,, BICORNIS, *Hall.*
,, ,, *var.* PELTIFER, *Lapw.*
,, ,, *var.* TRIDENTATUS, *Lapw.*
,, CŒLATUS, *Lapw.*
,, PEREXCAVATUS, *Lapw.*
DICRANOGRAPTUS RAMOSUS, *Hall.*
,, NICHOLSONI, *Hopk.*
,, FORMOSUS, *Hopk.*
DICELLOGRAPTUS MOFFATENSIS, *Carr.*
,, ,, *var.* DIVARICATUS, *Hall.*
DIDYMOGRAPTUS SUPERSTIS, *Lapw.*
CŒNOGRAPTUS GRACILIS, *Hall.*
,, PERTENUIS, *Lapw.*
,, SURCULARIS, *Hall.*
THAMNOGRAPTUS TYPUS, *Hall.*
CORYNOIDES CALICULARIS, *Nich.*
,, CURTUS, *Lapw.*

CRAIGAVAD.—The fossils noted from this locality were obtained from the railway cutting about three-quarters of a mile east of the station. A very small exposure of black shales occur associated with purple shales and grits. The few fossils obtained point to the similarity between the containing beds and those of Ballygrot, of which they are doubtless the south-westerly extension.

The accompanying table gives a list of the fossils which I have collected from the foregoing localities. The total number is seventy-five species and thirteen named varieties, in all representing twenty-five genera. This is exclusive of many doubtful forms that have been laid aside waiting better specimens to enable their identification; also, several that are undoubtedly new, but which are either too fragmentary or badly preserved to warrant a diagnosis.

The following is a synopsis of those already named, shewing the zoological groups to which they belong :—

SUB-KINGDOM.	CLASS.	SPECIES.	VARIETIES.
CŒLENTERATA.	RHABDOPHORA.	68	13
ANNULOSA.	CRUSTACEA.	3	
MOLLUSCA.	BRACHIOPODA.	3	
PLANTÆ.		1	

It will be noticed from the foregoing that a large proportion of the fossils belongs to one class—namely, the Rhabdophora or Graptolithina. It is not my intention to offer any suggestions as to the conditions which prevailed during the deposition of these fossiliferous black bands, conditions alike favourable to this singular group of organisms, and apparently unsuitable to others. It may be observed, however, that no group affords a better index to the palæontologist in his endeavours to unravel the sequence of rocks of Silurian age than does the Graptolithina. The number of known species is very large, and it has been ascertained that the vertical range of most of them is very restricted—many, indeed, being confined to zones of but a few inches in thickness. The immense profusion also in which they frequently occur stamps each zone with a character easily recognisable by those who study their form and character.

The similarity of the County Down rocks to those in South Scotland was conjectured, as before stated, so early as 1815. This conjecture appears to have been founded more upon the general appearance of the rocks of the two areas than upon any positive evidence that was then obtained from them Subsequent writers did little but repeat these early opinions; and I am unable to find any evidence adduced tending to prove their identity.

The true relationship of the Silurian strata of South Scotland, and their exact position in the geological system, were long a matter of debate, and claimed the attention of many of the best geologists of Britain. To Mr. Charles Lapworth, of St. Andrews, is, however, due the honour of having finally succeeded in unravelling the many knotty problems which the rocks of that district presented. A brief *resumé* of the conclusions arrived at by that gentleman, as given in a most exhaustive paper read before the Geological Society of London (1), may here be given, as I trust to be able to prove that they bear with equal force upon the rocks of the area under consideration.

The Silurians of South Scotland are best shown in the neighbourhood of the town of Moffat, in Dumfries. The prevailing rocks consist of a vast series of grey and purple greywackes and slates, with occasional bands of conglomerates, all dipping somewhat uniformly to the N.N.W. at high angles. Exposed in some of the deeper valleys and stream courses is another set of rocks of a totally different character, consisting of black carbonaceous shales and slates, swarming with Graptolites; associated with these beds are pale green and grey unfossiliferous mudstones. These black shales and their associated mudstones, which have been aptly designated the Moffat Series, occupy lenticular or boat-shaped areas in the mass of the barren greywackes, and form extended lines

(1.) Quarterly Journal Geol. Soc., London. Vol. XXXIV., p. 240.

more or less parallel, and often miles in length. They are found at intervals throughout the northern half of the uplands, from the North Sea to the Irish Channel, and follow the general direction of the strike of the beds. Their well-marked mineralogical character and their peculiar fauna at once distinguish them from the monotonous greywackes, and afford the geologist data upon which to work out the interrelation of the rocks of the entire series. Without attempting to follow the author in his description of the many sections and diagrams given in elucidation of his subject, I may briefly state that the rocks are found to be arranged in elongated anticlinals, running in a direction from about N.E. to S.W., and that the sub-parallel bands of black graptolitic shales of the Moffat Series form the axes of these anticlinals, and are only seen where denudation has cut sufficiently deep to expose them. The Moffat Series is thus proved to have been one continuous deposit, inferior in position to the prevailing greywackes through which it rises. Where best exposed the Moffat Series naturally falls into three divisions—an Upper, Middle, and Lower—named respectively the Birkhill, Hartfell, and Glenkiln Shales, from the several localities in which each division attains its greatest development. These three divisions possess distinctive lithological features; but as the entire group is full of perplexing contortions and inversions, and as the continuity of the beds is greatly broken by numerous faults running in different directions, it was impossible to work out their sequence from stratigraphical evidence alone. The aid afforded by the contained fossils is, however, most satisfactory, and has enabled the author not only to prove that the divisions must be assigned to different geological periods, but they are each divisible into several distinct zoological zones.

The correlation of these various sub-divisions with the typical Silurian area in Wales, and their foreign equivalents, is gone into with great minuteness by the author. I shall content myself by merely giving the conclusions arrived at, and beg to direct those anxious for further details in this department of the subject to the paper itself.

The lowest, or Glenkiln Shales, have been referred to the Upper Llandeilo, their nearest representatives in Wales being beds of that age yielding Graptolites, in the neighbourhood of Llandridod, Meadow Town, and Aberiddy Bay. Their American and Swedish equivalents bear out this view, and point to a high position for them in the Upper Llandeilo Series. The Hartfell beds have been proved to be the attenuated representatives of the Bala and Caradoc, and the Birkhill Shales correspond with the Coniston mudstones of the Lake District, which are of Lower Llandovery age. The accompanying table will give more clearly these Scottish divisions and sub-divisions, and I shall now proceed to give the evidence that has enabled me to append the columns relating to County Down.

Table shewing the Divisions and Sub-Divisions of the Moffat Series, and their equivalents in County Down.

	Wales	South Scotland.		County Down.	
		Scottish sub-divisions.	Number of Species.	Where represented.	Number of Species.
Middle Silurian.	Lower Llandovery.	Hawick Beds. Gala Group. Up. Birkhill Shales. Lwr. Birkhill Shales.	43.	Tieveshilly? Ballygowan, &c., &c. Coalpit Bay, Tullygarvan? Coalpit Bay.	14. 36.
Lower Silurian.	Bala, or Caradoc.	Up. Hartfell Shales, &c. Lwr. Hartfell Shales.	36.	Coalpit Bay, Tullygarvin? Carnalea, Orlock Point.	11.
	Up. Llandeilo.	Up. Glenkiln Shales.	35.	Coalpit Bay, Ballygrot. Craigavad, &c.	27.

As before stated, the section at Coalpit Bay is the best exposure of these fossil-bearing rocks in the district. The lowest are barren mudstones, which form the axis of a sharp anticlinal, and are followed by black flinty shales containing 11 species of Graptolites. The same species, associated with 15 others, are also found at Ballygrot, where a wider area of rock is exposed, thus indicating that the rocks of these widely separated localities are but parts of the same bed. This group of 26 species enables us at once to correlate these beds with those of South Scotland; and it is interesting to find that they agree almost fossil for fossil with those from the representative localities of Berrybush Burn and Black Linn, which are the upper beds of the Glenkiln Shales. The small exposure in the railway cutting near Craigavad has also yielded fossils of this age, and is doubtless but a south-westerly extension of the Ballygrot Beds. The same may be said of the black shales still farther to the south-west, in a quarry near Cultra, although I have not been able to procure any recognisable fossils from the greatly crushed rocks of this latter locality.

The lower Glenkiln Shales, which in South Scotland are comparatively unfossiliferous, may be represented in Ireland by the grey mudstones which form the centre of the anticlinal at Coalpit Bay, and by the series of unfossiliferous grey and purple shales associated with the black bands at Ballygrot.

The next beds in ascending order at Coalpit Bay are the barren mudstones noted in the detailed account of that locality at paragraph 5. The only fossils found associated with them were obtained from a fragment of black shale folded up in their broken strata. This fragment had doubtless been derived from some bed intimately associated with the mudstones, and which may yet be detected *in situ* among the shattered black bands at their base. The fossils which it has yielded, though few in variety, include *Dicellograptus Forchammeri*, Geinitz; *Climacograptus*, sp.? and *Diplograptus truncatus*, Lapw.;—species highly characteristic of a thin, but persistent, band of shale occurring near the base of the barren mudstones of the Upper Division of the Hartfell Series (1). This circumstance, coupled with the identity in lithological character of the barren beds in the two countries, leaves no doubt but that these Coalpit Bay Mudstones are the representative of that sub-division. This being admitted, it is evident that the rich beds of the Lower Hartfell Series are absent here, having either thinned out or been lost by faulting. The latter view is more probable, as we find them undoubtedly represented by the fossiliferous black-shales of Carnalea, which have yielded ten species of Graptolites, the following six species being peculiar to that sub-division:—*Diplograptus truncatus*, Lapw.; *Diplograptus quadrimucronatus*, Hall; *Lasiograptus Harknessi*, Nich.; *Retiolites*

fibratus, Lapw.; *Climacograptus tubuliferus*, Lapw.; *and Dicellograptus Forchammeri*, Geinitz. The remaining four species are common to the Hartfell, and the underlying Glenkiln Shales. So far as can be judged from the meagre list of fossils obtained at Orlock Point, the beds there exposed also belong to this group.

Again returning to the section in Coalpit Bay, we find the mudstones which have just been referred to the Upper Hartfell Series are separated from the next beds in ascending order, by a dyke which runs almost parallel to the strike, and which seems to occupy the line of an east and west fault. The rocks immediately south of this dyke are very rich in fossils, 36 species having been obtained from them, although the area exposed is of but very limited extent. The palæontological break between these and the preceding beds is most complete, not one of the extensive series of fossils being common to the two rock groups. Not only are the species different, but a marked change also takes place in the generic character of the fauna. All the old types of compound forms such as Cœnograptus, Thamnograptus, Dicellograptus, Dicranograptus, Leptograptus, &c., have disappeared, and their places have been supplied by the simpler genera Monograptus and Rastrites.

This extensive series of fossils admits at once of the correlation of the containing beds with the Birkhill Shales of the Moffat District, with the lower division of which as exposed at Dobbs Linn they almost exactly correspond, both in lithological character and fossil contents. In these beds also for the first time in the County Down rocks are we enabled to identify the life-zones so ably worked out in the Scottish beds. The zone of *Diplograptus acuminatus*, which is at the base of Birkhill Shales, is found, in part at least, quite close to the dyke above mentioned. The well-marked zone of *Diplograptus vesiculosus* follows it with a rich assemblage of species, often beautifully preserved. The succeeding zone of *Monograptus gregarius* is also easily recognised by the immense profusion in which that fossil, associated with *Rastrites peregrinus* (type) and other forms abound in it.

A series of greenish grey mudstones, with thin layers of white clay, separates the foregoing zones from the next fossil bands. The upper horizon of this barren group is in Scotland taken as the boundary line between the Lower and Upper Birkhills. The only other zone which can with certainty be recognised at Coalpit Bay, is that of *Diplograptus* (Cephalograptus) *conula*, which occurs at the top of the fossil bearing beds. It is just possible that the zone of *Monograptus spinigerus=Sedgwicki*, which follows the latter in Scotland, may be

(1). Quartl. Journal Geol. Soc., London. Vol. XXXIV., p. 316.

represented and in part combined with it, as several of its most characteristic fossils have been detected in its highest bands

The top of the Upper Birkhill Shales, marked by the zone of *Rastrites maximus*, has not yet been detected in Ireland; did it occur, its peculiar group of fossils would at once make it recognisable. Judging, however, from the fact that these upper beds thin out as they extend westward from the typical Moffat area, and that the zone of *R. maximus* seems to be absent from Wigtonshire, it is not likely that it will be detected here.

The grits and slates already referred to, which immediately overlie these black shales, are similar in lithological character to those of South Scotland. There they are the principal rock which forms the mountainous region known as the Southern Uplands; in County Down, however, though equally developed, their elevation is inconsiderable. As we pass southwards along the promontary of the Ards, these rocks assume in places a more flaggy and slaty character, and are in the neighbourhood of Greyabbey extensively quarried and formed into roofing slates. On some of the surfaces exposed at these quarries traces of organisms have been detected—tracks of annelids are abundant, —but the only forms that admit of identification are *Crossopodia Scotica*, M'Coy; *Nemertites tenuis*, M'Coy; and *Nemertites sp.?* Still further south, near Portaferry, bands of dark slate occur containing a group of Graptolites strikingly different from any we have yet met with in the district. The palæontological break between these and even the highest of the Coalpit Bay zones is almost complete. An examination shows that of the 14 species obtained from them, only 3 are common to the two localities, and the 11 which make their appearance for the first time indicate a much higher horizon for the containing beds than those in the northern portion of the county. These latter beds have no exact palæontological representatives in the typical districts of Scotland or Wales; their nearest is, perhaps, the rocks of Upper Middle Silurian age known as the Gala Group, occurring in the neighbourhood of Galashiels (1). The presence, however, of *Monograptus Riccartonensis* and other Upper Silurian species, and the absence of many of the Upper Moffat forms which occur in that series in South Scotland, points to a higher place in the Silurian System than that to which the Gala Group has been assigned. They are most probably the exact equivalents of the Hawick rocks of Scotland, which intervene between the Gala beds and the Upper Silurian of Riccarton (2); but as no

(1). Lapworth, on the Lower Silurian Rocks in the neighbourhood of Galashiels.—Trans. Edinburgh Geol. Soc., Vol. II., p. 46.

(2). Lapworth, On Scottish Monograptidæ.—Geo. Mag., 1876, p. 550.

fossils have yet been detected in these beds in Scotland, the evidence depends solely upon the peculiar fauna of the Irish beds. Their representatives in the Lake Disirict are probably the Knock beds exposed near Ambleside, which are considered to be, if not Upper, at least the passage between the Upper and the Middle Silurians (1). If this view of their position be admitted, it is evident that the grey grits and conglomerates which come in between this fossil band and the black shales at Coalpit Bay naturally fall into the place of the Gala Series. The evidence—in the absence of reliable fossils—which they afford tends to support this view. The conglomerates referred to constitute a well-marked zone, and consist of small pebbles of quarts, flakes of black shale, &c., in a grey gritty base. They are well shewn in the quarries at Ballygowan and elsewhere throughout the county, and are identical in character to beds which mark the base of the Gala Group in Scotland. The remaining rocks of this series consist of alternations of coarse grits and slates, void of any peculiar feature upon which to fix a horizon. It is this monotonous character of strata stretching over such vast areas in both Scotland and Ireland, and dipping in the same general direction, that has hitherto baffled all attempts to unravel their sequence, or define their exact position in the Silurian System. From the above, however, it is clear that they must be considered as of Gala age, the position of which is defined as the top of the Middle Silurian.

It will perhaps be difficult to define the boundary line between this Irish Gala group and the Portaferry beds. The fossils in the latter at Tieveshilly undoubtedly occupy only a black slaty band, the horizon of which in the series has not yet been fixed. The few organisms on the surfaces of the grey slates near Greyabbey afford very little help, but tend to prove that the rocks in which they occur belong to the Gala rather than to the Portaferry series.

It is to be hoped that the boundary line between these two sets of rocks may yet be defined; but the close resemblance between the unfossiliferous beds of both, and the heavy covering of drift by which they are hidden, will render this a work of extreme difficulty.

CONCLUSIONS.

THE Silurian Rocks of County Down are from the foregoing proved to belong to several distinct divisions of the system—

1st. The lowest, exposed at Coalpit Bay, the shales of Ballygrot, Craiga-

(1). Harkness and Nicholson on the Strata and their Fossil Contents, between the Barrowdale Series of the North of England and the Coniston Flags.—Quartl. Jourl. Geol. Soc., London, Voli XXXIII., p. 461,

vad, &c., are the representatives of the Glenkiln Shales, the equivalents of the Upper Llandeilo of Wales.

2nd. The black shales at Carnalea, and the barren mudstones at Coalpit Bay, represent respectively the Lower and Upper Hartfell Series, the equivalents of the Bala or Caradoc.

3rd The black shales of Coalpit Bay, characterised by the zones of D. acuminatus, D. vesiculosus, M. gregarius, and D. cometa, represent in part both the Lower and Upper Birkhill shales, which are paralleled with the Lower Llandoveries.

4th The grits and conglomerates which immediately succeed the latter are of the same age as the Gala Series, and occupy a high place in the Middle Silurians.

5th. The black shales and associated flags at Tieveshilly, near Portaferry, occupy either the extreme top of the Middle, or the base of the Upper Silurians, and are the highest Silurians yet recognized in the North-east of Ireland.

The geographical relation of the area under consideration to that of South Scotland and the general direction of the strike of the rocks in both districts, would naturally lead to the expectation of a certain degree of similarity between their geological characters; from the foregoing, however, it is clear that not only generally, but in detail, do they correspond in a remarkable degree. While it would, perhaps, be impossible, owing to the imperfect manner in which the fossil bands are exposed, to unravel the sequence of the various beds in County Down from an examination of them alone, the key afforded by the recent researches in the Scottish beds has made the subject a matter of ease. We are thus enabled for the first time, with some amount of certainty, to arrive at conclusions regarding the physical geology of the district. The three graptolitic shale bands and their associated mudstones have been overlaid by the grits and conglomerates so conspicuous in the county; all were folded into vast waves, the crests of which ran in a direction from about north-east to south-west. Subsequent denudation completely altered the contour of the district; and judging from the remnants of Carboniferous strata at Castle Espie and Cultra, it seems to have been covered by rocks of that age, and to have been again upheaved and subjected to denuding agencies, which probably left it in almost its present state. The granitic protrusions of the Mourne and Ballynahinch Mountains are supposed to have taken place during the Carboniferous epoch,

they are certainly subsequent to the deposition of the Silurians, which have been forced up and highly metamorphosed by them. The north-western boundary of the Silurian area has been subjected to the greatest amount of upheaval, and as denudation has reduced all to a somewhat uniform elevation, the lowest beds are here consequently most exposed. The Ballygrot beds form the axis of what was the most north-westerly anticlinal, the black shales of Crawfordsburn, Carnalea, and Orlock Point possibly represent waves of minor importance; while that at Coalpit Bay seems to have been one of considerable elevation.

Southward of this no exposures of the underlying shales are seen in Down; on the contrary, they and the overlying grits and conglomerates sink into a trough and are covered by higher beds at Portaferry in which the dark fossiliferous shales of Tieveshilly occur. Still further south, near Ardee, in County Louth, the underlying beds again come to the surface, the black Graptolite shales of the Hartfell series being well represented, in association with arenaceous bands containing other fossils of Bala or Caradoc age.

The foregoing exposition of the Silurian rocks of the County Down has been very much facilitated by the aid so kindly afforded by Charles Lapworth, Esq., F.G.S., of St. Andrews, who undertook the revision of the Graptolithina of our rocks; to his acuteness and critical judgment it is owing that our list of species is so extensive, many of the forms would otherwise have escaped detection. The monograph, with figures of the Graptolites of the County Down, which accompanies this paper is the most complete hitherto published in Britain, and I cheerfully acknowledge the obligations under which Irish geologists are placed for this synopsis of a most difficult group of fossils.

Through the kindness of William Bullock, Esq., of Donaghadee, I have had access to the fine collection of Coalpit Bay fossils, made by his father the late William Bullock, Esq. In addition to enriching my collection with a number of good specimens, Mr. Bullock has also placed a valuable series from the above locality in the Belfast Museum. The set has been completed, as far as possible, by a selection from my own collection, embracing forms representing the various beds, and including several type specimens, all of which will be available for future reference.

AIIE ꝺHꝺN, AND THEIL RANGE IN THE MOFFAT

ABBREVIATIOarked ° have not yet been detected in Ireland.

		County Down.								Moffat Series.		
		Tieveshilly	Coalpit Bay	Tullygarvan	Carnalea	Orlock Point	Crawford's Burn	Ballygrot	Craigavad	Birkhill Shales	Hartfell Shales	Glenkiln Shales
,,	18	..	vr	...	...	...	...	...	...	...	...	x
DICELLOGRAPTU	8	...	r	...	...	...	vr	...	vr	...	x	...
,,	17	...	r	...	r	...	...	...	r	...	x	...
,,	19	...	...	...	...	...	...	r	...	...	x	x
,,	20	...	...	...	...	...	...	r	...	...	...	x
,,		...	...	...	...	...	...	...	...	...	x	...
,,	4	...	...	...	...	...	...	...	r	...	x	x
,,		...	...	...	...	...	...	...	...	x	...	...
,,		...	...	...	...	...	...	...	...	...	...	...
DIDYMOGRAPTU		..	...	...	...	...	...	r	r	...	...	x
,,	5											
LEPTOGRAPTUS,	4	...	...	...	c	c	...	r	...	...	x	x
,,												
CŒNOGRAPTUS,												
,,	1	...	...	...	...	...	...	c	r	...	...	x
,,	2	...	...	...	...	...	...	vr	...	...	...	x
,,	3	...	...	...	...	...	...	vr	...	...	...	x
THAMNOGRAPTU												
,,	6	...	...	...	...	...	...	vr	r	...	...	x
DICTYONEMA, *H*												
,,	7	...	...	...	r	...	...	...	...	...	x	x
CORYNOIDES, *N*												
,,	8	...	r	...	...	...	...	r	r	...	x	x
,,	9	...	r	...	...	...	...	r	r	...	x	...
DISCINA, *Lamar*												
,, Por	2	....	...	...	...	...	...	vr	...	...	x	x
ACROTRETA, *Da*												
,, Nic	1	...	vr	...	...	...	...	...	...	...	x	...
ACROTHELE, *Lin*												
,, gra	0	...	vr	...	...	...	...	...	...	...	...	x
DAWSONIA, *Nich*												
,, can	3	...	c	...	...	...	...	...	...	x	...	...
DISCINOCARIS, *H*												
,, Bro	5	...	r	...	...	...	...	...	...	x	...	...
PELTOCARIS, *Sal*												
,, apt	4	r	vr	...	...	...	...	...	...	x	...	...
BUTHOTREPHIS,												
,,		...	...	...	...	vr		...	...	...	...	..

[*Proceedings Belfast Naturalists' Field Club—Appendix*, 1876-77.]

ON

THE GRAPTOLITES OF COUNTY DOWN.

By CHARLES LAPWORTH, F.G.S.

The Graptolites discovered by Mr. Swanston in the black carbonaceous shales among the Silurian rocks of County Down constitute a very distinct assemblage, which is identical with that afforded by the Graptolitic bands forming the well-known *Moffat Series* of the south of Scotland. In Scotland the containing deposits have already furnished sufficient stratigraphical and palæontological evidences to allow of the determination of their natural divisions and subdivisions, and of their precise systematic position in the general succession of Silurian deposits. The black shales of County Down, however, are so excessively convoluted and shattered, that as yet it has not been found possible to fix either their total thickness or the characteristics of their component zones. That the general grouping of the beds among them is essentially similar to, if not identical with that of the Moffat Series, may nevertheless be regarded as certain. Exactly as in South Scotland, certain special forms are invariably found in association, while the proportion of the species, and the lithological features of the containing beds, are absolutely identical with those of the corresponding zones of the Moffat Series. It is possible that in the future, local stratigraphical testimony respecting the inter-relations of the various beds may be detected; but the sequence of the different fossil groups in the South of Scotland is so clear, that beyond demonstrating their identity with those of the Moffat Rocks, this would add but little to our present knowledge.

The Coalpit Bay Division of the County Down Silurians has yielded all the Graptolites of the Birkhill shales, with the exception of one special group, viz., that of the *Rastrites maximus* zone, which lies at the very summit of the Moffat

series. This circumstance is very naturally accounted for. The black shale zones of the Moffat series die out one by one, from above, as we pass outward to the north-west, from the typical Moffat area. From this cause the *Rastrites maximus* is not present in Wigtonshire, and is consequently missing also from the Black shales of the northern part of County Down, which are actually the south-westerly extension of the Wigtonshire Silurians. Should the black shales be detected in the future in the southern districts of the County Down, the *maximus* zone will probably be found occupying its natural position immediately below the greywackes.

The Hartfell shales are as yet less perfectly represented. The Barren Mudstones of the Upper Hartfell are seen in Coalpit Bay; and a striking proof of the perfect identity of these beds is afforded by the fact that they exhibit the peculiar fossil-bearing seam occasionally visible in the Moffat area. The association of fossils, their state of preservation, and the mineralogical character of the seam, are precisely identical with those of this persistent seam in Scotland. The zone at the summit of the Hartfell shales—viz., the zone of *Dicellograptus anceps* (Nich.) has not yet been discovered. Neither has any trace been found of the prolific zone of *Pleurograptus linearis*. The typical, or *Dicranograptus Clingani* zone, is indeed the only portion of the Lower Hartfell whose existence in these deposits has been fully established.

The upper, or fossiliferous portion of the Glenkiln shales, is present at Ballygrot (Greypoint), and in the section in Coalpit Bay. All its chief characteristic fossils have been already collected from these localities.

The fossils of the overlying sheet of Greywackes and flagstones are those of the great Greywacke (Gala or Valentian) group of the South of Scotland. They point to a comparatively high place in this group. The association is such as we might expect in the Hawick Rocks, which lie at the summit of the Middle Silurians of the South of Scotland, but which have not hitherto afforded any determinable species of Graptolithina.

The forms common to Ireland and Scotland may be seen on an inspection of the table (p. 124), where the range of the Irish species in the typical Scottish series is given.

The Irish species of Graptolithina, though generally in a fair state of preservation, are usually fragmentary; and the figuring of even the best specimens of the various forms would give a very inadequate idea of their characteristic appearance. As they are precisely identical in every respect with the Scotch forms, I have thought it best to figure some of the more perfect examples of the forms occurring in the County Down from my own collection, which has

been almost wholly derived from the equivalent black shales of the Moffat series. Several of these have already been figured by myself in the "Catalogue of the Western Scottish Fossils," issued under the auspices of the British Association (Glasgow, 1876).

To such species or varieties as are yet undescribed a brief diagnosis is here appended.

Genus I. RASTRITES, Barrande. (Grapt. de Boheme. Pl. 4.)

According to Herr Richter, the thecæ in this genus are mere orifices in the periderm of the common canal, and the long isolated and perpendicular tubes are simply ornamental or defensive extensions of the test. (1.) The British specimens which have hitherto come under my notice have afforded no support whatever to this opinion.

Mr. W. Carruthers figures a magnificent example of *Monograptus spiralis* (Geinitz), (2) of which a well-marked example of *Rastrites peregrinus* (Barr.) seems to form the initial portion, and to be organically connected with it. I have recently examined the specimens from which the figure was taken, and I am inclined to believe that this appearance is owing to the accidental juxtaposition of the two forms.

1. Sp. 1. *Rastrites peregrinus.* Barr, Plate 5, fig. 1.

The typical form of this well-known species is abundant in the dark shales of Coalpit Bay, a locality which has yielded the only specimens known to me in which the virgula is apparent as a distinct structure. (3). Locality—Coalpit Bay.

2. Var. *hybridus.* Lapw. Plate 5, fig. 2.

This variety is possibly identical with the fragmentary form *Rastrites fugax* of Barrande. (Grapt. de Boheme. Pl. 4.) Locality—Coalpit Bay.

Genus II. MONOGRAPTUS, Geinitz. Restricted. (Die Graptolithen, p. 32.)

3. Sp. 1. *Monograptus triangulatus.* Hark. Pl. 5, fig. 14. Locality—Coalpit Bay and Tullygarvan.

(1.) Richter. Aus die Thuringe Gebirge, Zeit. der Deutsch Gesellschaft, 1871.
(2.) Carruthers. Geological Magazine, 1868. Pl. 5, fig. 1.
(3.) Geological Magazine, 1876. Pl. 10, fig. 1.

4. Sp. 2. *Monograptus spiralis.* Geinitz. (Leon & Bronn, Jahrbuch, für. Min. 1842. Pl. 10.) Pl. 5, fig. 12.

This species is usually identified with *Prionotus convolutus* of Hisinger, but according to Dr. Linnarsson (1.) the latter was originally founded upon a specimen of *Rastrites peregrinus* (Barr.). Locality—Tieveshilly.

5. Var. *(a). fimbriatus.* Nich. Pl. 5, fig 17. Locality—Coalpit Bay.

6. Var. *(b). communis.* Lapw. Pl. 5, fig. 16.

The two preceding forms are certainly most intimately allied. The latter has an extended range, and varies much in the forms of the polypary and hydrothecæ, and seems to pass into the following form, *M. fimbriatus*, on the other hand, is very local in its distribution, and constant in its general features. Locality—Coalpit Bay.

7. Var *(c). proteus* (?). Barr. Pl. 6, fig. 18.

It is doubtful if this form is actually identical with Barrande's species. His figures remind one rather of *M. crispus* (Lapw.); and the group typified by *M. lobiferus* (M'Coy). Locality—Coalpit Bay.

8. Sp. 3. *Monograptus Sedgwicki.* Portl. Pl. 5, fig. 15. Locality—Coalpit Bay.

9. Sp. 4. *Monograptus turriculatus.* Barr. Pl. 5, fig. 11.

As in South Scotland, the majority of the specimens of this species in the beds of County Down are of very diminutive size. Locality—Tieveshilly.

10. Sp. 5. *Monograptus crispus.* Lapw. Pl. 5, fig. 13. Locality—Tieveshilly.

11. Sp. 6. *Monograptus exiguus.* Nich. Pl. 5, fig 9. Locality—Tieveshilly.

12. Sp. 7. *Monograptus Barrandei.* Suess. Pl. 5, fig. 21. Locality—Tieveshilly.

13. Sp. 8. *Monograptus runcinatus.* Lapw. Pl. 5, fig. 7. Locality—Tieveshilly.

(1.) Linnarsson. Afdreg ur Geologiska Foreningens i Stockholm Forhandlingar, 1877. No 40. Band III. No. 12.

14. Sp. 9. *Monograptus lobiferus.* M'Coy. Pl. 5, fig. 6.

This species occurs in the black shales of Coalpit Bay in a few of the common varieties, in all of which the extremity of each theca seems to form a rounded lobe, the aperture being apparently directed partly inward and partly upward against the lower wall of the central portion of the tube. According to Dr. Linnarsson, who has found specimens of this species in the *lobiferus* schists of Sweden, preserved in relief, the hydrotheca is actually coiled obliquely, and thus the aperture opens outward in a different plane to that of the proximal portion of the theca, which is wholly free. Locality—Coalpit Bay.

In the grey schists of Tieveshilly this species appears to be represented by the following form :—

15. Var. *pandus.* Lapw. Var. nov. Pl. 6, fig. 3.

Polypary simple, monoprionidian, stout, straight ; from four to six inches in length, and with an average diameter of ¼ of an inch in the fully developed portion, inclusive of the projection of the hydrothecæ. These are arranged in the proportion of from 24 to 28 to the inch, and are in contact only. They are broad at their origin, and have the superior margin almost horizontal. They narrow rapidly towards their outer extremity, which is bent downwards in the direction of the proximal extremity of the polypary.

This form has been frequently noticed by palæontologists, but its distinctness has not hitherto been acknowledged. Barrande (Grapt. de Boheme. Pl. 1, figs. 10 to 14) and Geinitz (Die Graptolithen, Taf. III, figs. 24, 25, &c.) both refer it to *Monograptus priodon.* (Bronn). From that species, however, it is easily distinguished by the general form of the theca, and the absence of overlap. From *Monograptus Clingani* (Carr.) it differs in the size and shape of the polypary. Locality—Tieveshilly.

16. Sp. 10. *Monograptus priodon.* Bronn. Pl. 5, figs. 24a, and 24b. Locality—Tieveshilly.

17. Sp. 11. *Monograptus Riccartonensis.* Lapw. Pl. 5, fig. 23. Locality—Tieveshilly.

18. Sp. 12. *Monograptus Galaensis.* Lapw. Pl. 6, fig. 1. Locality—Tieveshilly.

The two preceding species are found in association at Tieveshilly. In Scotland the former appears to be restricted to the *Riccarton Beds* (Wenlock); and the latter occurs only in the *Gala Group* (Llandovery).

19. Sp. 13. *Monograptus M'Coyi.* Lapw. Sp. nov. Pl. 6, fig. 2.

Polypary simple, monoprionidian, straight, several inches in length, and with an average width of one-sixth of an inch. Hydrothecæ about 30 to the inch, in contact throughout the whole of their extent, inclined at an angle of 45°; of the general form of slender quadrangular tubes, about five times longer than broad; apertural margin convex, expanded into an oblique, blunt, triangular denticle. (Loc. Builth Bridge, Radnor.)

The foregoing diagnosis has been drawn up from M'Coy's figure and description of a form from the Silurian Rocks of Wales (Palæozoic Rocks and Fossils. Pl. 1 B, fig 7, and p. 4) (1.) which he erroneously identified with his *Graptolithus latus*, originally founded upon a fragment of a Dichograptidian species, from the Skiddaw Slates of the Lake District (Quart. Journal Geol. Society, vol. 4, p, 223). Locality—A single well-preserved fragment only has been obtained from the Llandovery beds of Tieveshilly.

20. Sp. 14. *Monograptus Hisingeri.* Carr. (See Geo. Mag., 1868. Pl. 12, fig. 1.)

(a). Typical form. Locality—Tieveshilly.

21. *(b).* Var. *jaculum.* Lapw. Pl. 5, fig. 20. Localities—Coalpit Bay and Tullygarvan.

22. Sp. 15. *Monograptus cyphus.* Lapw. Pl. 5, fig. 25. Localities—Coalpit Bay and Tullygarvan.

23. Sp. 16. *Monograptus leptotheca.* Lapw, Pl. 5, fig. 22. Locality—Some doubtful fragments only of this species have been collected from the black shales of Coalpit Bay.

24. Sp. 17. *Monograptus concinnus.* Lapw. Pl. 5, fig. 19. Locality—Coalpit Bay.

(1.) Compare Römer in Leon and Bronn, Jahrbuch f Min., 1855. p. 541, plate 8, fig. 2.

25. Sp. 18. *Monograptus gregarius.* Lapw. Pl. 5, fig. 4. Locality—The characteristic fossil of the central portion of the Birkhill shales. It occurs in myriads in the black shales of Coalpit Bay.

26. Sp. 19. *Monograptus argutus.* Lapw. Pl. 5, fig. 5.

The accompanying figure, as well as that illustrative of the original description of this species, was taken from a cast of a compressed example. In specimens preserved with their relief the hydrothecæ resemble those in *Dicellograptus*, having a deep excavation in the distal portion of their outer wall, while the aperture opens obliquely outwards, partly overlapping the lateral wall of the common canal. Locality—Coalpit Bay.

27. Sp. 20. *Monograptus Sandersoni.* Lapw. Pl. 5, fig. 8. Localities—Coalpit Bay and Tullygarvan.

28. Sp. 21. *Monograptus tenuis.* Portlock. Pl. 5, fig. 10. Localities—Coalpit Bay and Tullygarvan (?)

29. Sp. 22. *Monograptus attenuatus.* Hopk. Pl. 5, fig. 3. Locality—Coalpit Bay.

Genus III. DIMORPHOGRAPTUS, provisional genus. Lapworth. (Geo. Mag., 1876, p. 545.)

Examples of this genus are found in great profusion both in Ireland and Scotland, and in all we find the characteristic mono-diprionidian polypary. Nevertheless, in the complete absence of specimens preserved in relief, I have grave doubts of the validity of the genus. We meet with occasional examples in which we have a hint of a second series of hydrothecæ in the proximal portion. It is just possible that in this group the concavo-convexity of the polypary general among the diprionidian Graptolites is carried to excess; and that the partial invisibility of the second series of hydrothecæ is due to their lying almost parallel with those of the first series.

30. Sp. 1. *Dimorphograptus Swanstoni.* Lapw. Pl. 6, fig. 5.

A most remarkable and very distinct little species. It occurs in admirable preservation in the Coalpit Bay division of the County Down black shales, but has not hitherto been detected in the corresponding zone of the Moffat Series. Geinitz figures an example of this species from the *Kiesel-scheifer* of Central Germany. (Die Versteinerungen, Taf. 1, fig. 25.) Locality—Coalpit Bay.

31. Sp. 2. *Dimorphograptus elongatus.* Lapw. Pl. 6, fig. 6. Locality—Coalpit Bay.

Genus IV. CEPHALOGRAPTUS. Hopkinson. (Journal Quekett Micros. Club, 1869.)

32. Sp. 1. *Cephalograptus cometa.* Geinitz. Pl. 6, fig. 4. Locality—Coalpit Bay.

Genus V. DIPLOGRAPTUS. M'Coy. (Annals and Mag. Nat. His.).

In addition to the diprionidian form of the polypary, the chief characteristic of this genus is generally held to be the fact that the central canal is divided longitudinally, by a vertical septum or diaphragm, into two distinct portions which do not communicate with each other—at least in the later stages of the growth of the polypary. In one group, however—viz., the sub-genus *Glyptograptus* (Lapw.)—none of the examples preserved with their relief which have hitherto come under my notice, give evidence of the presence of this diaphragm; but, on the other hand, the cœnosarcal tube appears to be undivided, and to be in organic connection with both series of hydrothecæ, as in *Retiolites.*

33. Sp. 1. *Diplograptus acuminatus.* Nich. Pl. 6, fig. 7.

The characteristic fossil of the lowest zone of the Llandoveries of South Scotland. It is as yet unknown in Ireland.

34. Sp. 2. *Diplograptus modestus.* Lapw. Pl. 6, fig. 8. (Catl. Western Scott. Fossils. Plate 2, fig. 33.) Locality—Coalpit Bay.

35. Sp. 3. *Diplograptus sinuatus.* Nich. Pl. 6, fig. 9. Locality—Coalpit Bay.

36. Sp. 4. *Diplograptus tricornis.* Carr. Pl. 6, fig. 10. Localities—Coalpit Bay, Ballygrot, and Craigavad.

37. Sp. 5. *Diplograptus angustifolius.* Hall. Pl. 6, fig. 11. Localities—Coalpit Bay and Ballygrot.

38. Sp. 6. *Diplograptus tamariscus.* Nich. Pl. 6, fig. 12. Locality—Coalpit Bay.

39. Sp. 7. *Diplograptus dentatus.* Brongn. Pl. 6, fig. 13. Locality—Ballygrot.

40. Sp. 8. *Diplograptus Hughesi.* Nich. Pl. 6, fig. 14. Locality– Coalpit Bay.

41. Sp. 9. *Diplograptus insectiformis.* Nich. Pl. 6, fig. 15. Locality—Ballygrot.

42. Sp. 10. *Diplograptus folium.* His. Pl. 6, fig. 16. Locality—Coalpit Bay.

43. Sp. 11. *Diplograptus truncatus.* Lapw. Pl. 6, fig. 17,
Diplograptus pristis, var. *truncatus.* Lapw. (Catl. Western Scott, Fossils. Plate 1, fig. 28.)

Polypary diprionidian, sub-fusiform or with parallel margins, one to three inches in length and one-eighth of an inch in maximum diameter; furnished proximally with a minute radicle and lateral spines. Virgula invisible. Hydrothecæ inclined at an angle of about 45 degrees, linear-tubular, expanding towards the oblique apertural margin and ornamented with minute transverse striæ.

There are several varieties of this species in the South Scottish rocks, but they agree generally in the foregoing characteristics. Some smaller and wider examples of this form are almost inseparable from *Dip. palmeus.* Forms preserved in relief show no trace of a longitudinal septum on one of the lateral faces. I formerly referred this species to *Diplograptus pristis* of Hisinger, but Swedish specimens of the latter show a polypary and hydrothecæ of the general type of *Diplograptus quadrimucronatus* (Hall).

44. Sp. 12. *Diplograptus foliaceus.* Murch. Pl. 6, fig. 18. Locality—Ballygrot.

45. Sp 13. *Diplograptus vesiculosus.* Nich. Pl. 6, fig. 19. Locality—Coalpit Bay.

46. Sp. 14. *Diplograptus quadrimucronatus.* Hall. Pl. 6, fig. 20.

In the Scottish examples referred to this species, four rigid spurs are usually given off, one from each of the angles of the prismoid polypary at a normally uniform height corresponding to the position of the sixth or seventh hydrotheca, counting from the initial extremity.

In the Irish forms collected by Mr. Swanston the spurs are sometimes

regularly disposed in two opposite series, and sometimes irregularly scattered along the extent of the outer margin of the polypary.

These forms are all certainly allied to *Glossograptus*, but our present evidences are insufficient to justify their removal to that genus. Locality—Carnalea.

47. Sp. 15. *Diplograptus Whitfieldi.* Hall. Pl. 6, fig. 21.

The interesting examples furnished with lateral reproductive appendages, figured by Hall in his Graptolites of the Quebec group, Plate B, and assigned by him to the present species, are clearly distinct. It is most probable that they belong to a form of *Lasiograptus* (?) resembling *Lasiograptus bimucronatus*, Nich. Locality—Carnalea.

48. Sp. 16. *Diplograptus (Lasiograptus?) mucronatus.* Hall. Pl. 6, fig. 22.

In this series the apertural fibres occasionally anastomose; and examples with lateral reproductive appendages are not infrequent in the Moffat Series in Scotland. In Ireland the species is as yet unknown.

49. Sp. 17. *Diplograptus (Hallograptus) bimucronatus.* Nich. Pl. 6, fig. 23.

It is in this species that the lateral reproductive processes are most frequently met with in British Rocks. Few examples of this form occur which appear wholly destitute of them, or of the lateral fibres which support them. Mr. W. Carruthers has suggested that this form, and the very similar *Diplograptus mucronatus* should be erected into a new genus under the title of *Hallograptus*, in honour of the eminent palæontologist, who was the first to figure these forms and to suggest the possible function of their remarkable appendages.

Genus VI. GLOSSOGRAPTUS. Emmons.

50. Sp. 1. *Glossograptus Hincksii.* Hopk. Pl. 6, fig. 24.

The lateral appendages in this species and genus differ from those in *Hallograptus*, in being rigid blind spurs comparable with those at the proximal extremity of *Climacograptus bicornis* (Hall). In all the supposed species of this genus, the apertural spines are also remarkably stout and rigid, but they never anastomose as in the older and very closely allied genus *Retiograptus* of Hall. (Grapt. Quebec Group, Plate 16, figs. 6 to 8). *Glossograptus ciliatus*, Emmons (American Geol., vol. 1, plate 1, fig 25); *Glossograptus setaceus*, Ibid. Fig.

20; *Diplograptus ciliatus*, Ibid. Fig. 19; *Diplograptus spinulosus*, Hall. *Diplograptus fimbriatus*, Hopk. (Geol. Mag., 1872. Pl. 12, fig. 8.) *Diplograptus pinguis*, Ibid. Fig. 7; all belong to this genus and will probably prove to have been founded on either one or two distinct species: the aspect of the polypary varying to an extraordinary degree according to the direction in which the compression has been effected. Localities—Coalpit Bay and Ballygrot.

Genus VII. LASIOGRAPTUS. Lapworth

51. Sp. 1. *Lasiograptus Harknessi*. Nich. Pl. 6, fig. 26.

An examination of Nicholson's type specimen of his *Diplograptus Harknessi* has convinced me that it is identical with my *Lasiograptus costatus*, which must consequently be suppressed. This species has a great range in the Moffat Series, passing upwards from its very lowest beds into the middle of the Hartfell Shales. Occasionally a specimen is detected in which the ventral spines are rudimentary and do not anastomose. Locality—Carnalea.

52. Sp. 2. *Lasiograptus margaritatus* Lapw. Pl. 6, fig. 25

Polypary diprionidian, about one inch in length and about one-eighth of an inch in diameter, inclusive of the marginal net-work. Virgula capillary, just visible beyond the distal margin Hydrothecæ 25 to 30 to the inch, free, triangular in form, with long-pointed denticles which are developed horizontally outwards as distinct filaments to a distance equal to the width of the central portion of the polypary, where they are split up into several subordinate threads. These are united to those similarly derived from the hydrothecæ immediately above and below. and thus originate a continuous series of marginal meshes completely surrounding the polypary.

In this species the hydrothecæ are of the type of those of *Diplograptus mucronatus* (Hall), and the general aspect of the polypary is essentially similar to that of *Diplograptus limucronatus* (Nich.). In *Lasiograptus Harknessi* the thecæ resemple those of *Climacograptus*. Locality—Unknown in Ireland.

Genus VIII. CLATHROGRAPTUS. Lapworth.

53. Sp. 1. *Clathrograptus cuneiformis*. Lapw. Pl. 6, fig. 27.

The figure shows merely the skeleton framework of the polypary. In well

preserved specimens this skeleton is covered and partially hidden from sight by a thin continuous membrane showing cell-apertures. Locality—Ballygrot.

The genus *Retiograptus* of Hall included three distinct genera. The title of *Retiograptus* is best restricted to the forms to which it was first applied, viz., those of the type *Retiograptus tentaculatus*, which combines the generic characters of *Glossograptus* and *Lasiograptus*. *Clathrograptus* embraces the simple diprionidian forms of the type of *Retiograptus Geinitzianus* (Hall, non Barrande). A third genus remains, which is typified by the extraordinary compound species *Retiograptus nucharis*, from Lake St. John.

Genus IX. RETIOLITES. Barrande.

54. Sp 1. *Retiolites fibratus*. Lapw. Pl. 6, fig. 28.

Polypary simple, diprionidian, one or two inches in length and one-fourth of an inch in breadth; margins parallel, proximal end broadly rounded and destitute of ornament. Virgula stout, straight, distally prolonged, Hydrothecæ 24 to 28 to the inch, their position being indicated by broad regularly quadrangular meshes. Epiderm continuous, supported on a skeleton framework of interlacing threads.

This form, which is remarkably abundant in the higher zones of the Lower Hartfell of South Scotland, is intimately allied to the forms here united under *Retiolites perlatus* (Nich.), but differs from them mainly in the form of the thecal meshes, and in the frequent presence of lateral appendages. Locality—Carnalea.

55. Sp. 2. *Retiolites perlatus*? Nich. (Geo. Journal, vol. xxiv., p. 530.)

The original example of this species is too imperfectly preserved to enable us to recognize any specific character beyond the great breadth of the polypary and the extraordinary width of the dermal meshes. In this respect it agrees with certain views of the two following forms which occur in the South of Scotland, but neither of which it is as yet possible to identify with the *R. perlatus* of the Coniston Mudstones.

56. Var. *Daironi*. Var. nov. Lapw. Pl. 6, fig. 30.

Occasionally three or four inches in length. In the characteristic view it resembles a gigantic specimen of *Dip. palmeus* (Barr.), with a retiform covering. In addition to this network this form must have possessed a continuous superficial membrane of sufficient thickness to

leave indubitable traces of its presence upon the matrix. Locality—Coalpit Bay.

57. Var. *obesus*. Lapw. (Rept. Brit. Assoc. 1871.) Pl. 6, fig. 29.

The special features of this form are the great size and the elegant and characteristic shape of the thecal meshes. The thecæ themelves appear almost horizontal. Locality—Unknown in Ireland; common in the Gala Group of South Scotland, and in the highest seams of the Birkhill shales.

Genus X. CLIMACOGRAPTUS. Hall. (Grapt. Quebec Group, p, 111.)

According to Professor Hall, the polypary in this genus has no central septum, and the hydrothecæ are simple openings in the outer test of a single internal cœnosarcal canal. By Professor Nicholson, on the other hand, the polypary is believed to be formed, actually or theoretically, of two monoprionidian polyparies placed back to back; their dorsal walls being flattened into a bilaminate median septum, and their virgulæ coalescing into a double central virgula. I have verified the accuracy of the latter theory in the species *Climacograptus scalaris* (His.), in several of its varieties, and in *C. Wilsoni.* (Lapw.); but if the analogy furnished by the structure of *Diplograptus* as described above, is to guide us, it is not impossible that both these interpretations are correct, each for itself, and that within the limits of *Climacograptus*, as at present received, are included some forms in which the median septum is continuous from side to side, and others in which the hydrothecæ of both series open into one and the same central cœnosarcal canal.

58. Sp. 1. *Climacograptus scalaris*. His. (Non Linnæus.) (Lethea Suecica, Plate xxxviii.)

The form figured by Linnæus as *Graptolithus scalaris*, (1) was a *Monograptus* allied to *M. colonus* of Barrande, from the Upper Silurian strata in which the genus *Climacograptus* is unknown. Examples in my possession procured from the same locality whence Linnæus obtained his species show the peculiar scalariform appearance figured by him, with great distinctness. They are also associated with unrolled examples of a spiralis like *Cyrtograptus*, as in his original drawing. Linnæus' name, *scalaris*, should be employed for the *Monograptus*, to which he originally applied it; but in the meantime it is perhaps inadvisable to disturb Hisinger's title for the Swedish *Climacograptus*. The following forms,

1 Skanska Resa., p. 147.

which are usually referred by palæontologists to this species, all agree in the possession of a tapering polypary, destitute of proximal ornamentation; perpendicular, short, square, hydrothecæ; and straight, or very gently undulating suture.

59. Var. *a. tectus.* Barrande. (Grapt. de Boheme. Pl. 1, figs. 19 and 20.)

Virgula never distally prolonged. Locality—Rare in the Gala Group of South Scotland, unknown as yet in County Down.

60. Var. *b. normalis.* Lapw. Pl. 6, fig. 31.

Polypary with sub-parallel margins. Virgula greatly prolonged distally. Locality—Abundant in Coalpit Bay.

61. Var. *c. Climacograptus rectangularis.* M'Coy. Pl. 6, fig. 32.

Virgula prolonged, proximally only, to a considerable length. Polypary tapering. Locality—Unknown in Ireland. Rare in the Birkhill Shales of Moffat.

62. Var. *d. Climacograptus caudatus.* Lapw. Pl. 6, fig. 34.

Polypary tapering, several inches in length, with stout virgula prolonged both proximally and distally to a length equal to that of the polypary itself. Locality—Unknown in Ireland.

63. Var. *e. Climacograptus tubuliferus.* Lapw. Pl. 6, fig. 33.

Polypary with parallel margins, virgula distally prolonged and expanded into a long flattened plate or vesicle. Locality—Carnalea.

In Scotland each of the foregoing forms has a definite range in the succession of Silurian deposits. They are all most certainly very intimately allied, but it is possible that we may eventually be forced to look upon them as distinct species. Such of these forms as are known upon the Continent have a corresponding vertical range, and appear to possess similar external features.

64. Sp. 2. *Climacograptus Scharenbergi.* Lapw. Pl. 6, fig. 36. (Catl. West. Scott. Fossils. Plate 2, fig. 36).

Polypary diprionidian, about an inch in length and one-twelfth of an inch in average diameter; proximal end ornamented with a short radicle

only. Suture deep, zigzag, having each angle prolonged in a short horizontal groove. Virgula distally prolonged. Hydrothecæ 28 to 36 in the space of an inch, short, perpendicular, with the distal extremity of each very slightly introverted.

The chief characteristic of this species is afforded by its remarkable sutural groove. This is distinctly angulated, running in zig-zag straight lines from side to side. From the outer point of each angulation a short horizontal groove continuous with that of the suture traverses the covering of the cœnosarcal tube almost to its outer edge.

This form has been frequently figured by palæontologists, even under its most typical aspect, but always in association with closely allied forms. (1) Its characters are so unique that there can be no hesitation in regarding it as a distinct species.

The various forms here referred to *C. Scalaris*. His. universally abound in Bala and Lower Llandovery rocks. They are unknown apparently in rocks of Llandeilo and Lower Bala age, where their place is taken by the present species, which occurs in Wales, Scotland, and Scandinavia in these ancient formations. The two forms doubtfully overlap for a short period in the *Clingani* zone of the Hartfell shales of the Moffat area. Localities—Scotland—in the Glenkiln and lowest Hartfell beds everywhere. Ireland—Ballygrot, Craigavad, and Coalpit Bay.

65. Sp. 3. *Climacograptus bicornis*. Hall. Type form. Pl. 6, fig. 38a. Locality—Ballygrot.

66. Var. *(b.) tridentatus*. Lapw. Pl. 6, fig. 38c.

67. Var. *(c.) peltifer*. Lapw. Pl. 6, fig. 38b.

68. Sp. 4. *Climacograptus cælatus*. Lapw. Pl. 6, fig. 39.

The figure which illustrates the original description of this species (Quart. Journ. Geol. Soc., 1875, Pl. 35, fig. 8) is a very bad one. The original diagnosis should be compared with the figure on plate of the present memoir. In the Welsh specimens the hydrothecæ are more deeply divided and the

(1) Compare, for example, Böch, Bernerk aug., Graptolitherne, Taf. 1, figs. 3, 10, 15, 18. Scharenburg, Ueber Graptolithen, Taf. 2, figs. 24, 25, &c., &c. Salter Q. J. G. S., vol. viii., pl. 7, fig. 3. Torquist.

interspaces are more oblique than in the Scottish forms. Locality—Coalpit Bay and Ballygrot.

69. Sp. 5. *Climacograptus Wilsoni.* Lapw. Pl. 6, fig. 40. (Catl. Western Scottish Fossils, 1876. Pl. 2, fig. 46.)

Polypary two to four inches in length and one eighth of an inch in maximum diameter; proximal end abrupt, furnished with two short horizontal radicular processes. Septum direct. Virgula stout, distally prolonged for a distance nearly equal to the length of the polypary; and supporting proximally a large elliptical vesicle. Hydrothecæ 16 to 20 to the inch; short, square, perpendicular; excavation shallow, horizontal.

Closely allied to the foregoing and following species—Locality—Unknown in Ireland.

70. Sp. 6. *Climacograptus per-excavatus.* Lapw. Pl. 6, fig. 35.

Polypary one and a half inches in length, and about one eighth of an inch in breadth; margins parallel till close upon the proximal extremity which is broadly rounded off, and ornamented with three short, stift, proximal spines. Virgula distally prolonged. Hydrothecæ 28 to 36 to the inch, with inclined partition walls; excavations wide and deep, occupying more than half the ventral margin of the polypary, and from one-fourth to one third of its transverse diameter. Horizon—Glenkiln shales. Localities in Scotland—Craigmichan, Glenkiln, Leadhills. In Ireland—at Ballygrot and Coalpit Bay. A most prolific species, it occurs in great abundance at the localities cited.

71. Sp. 7. *Climacograptus innotatus.* Nich. Pl. 6, fig. 37. Locality—Coalpit Bay.

Genus XI. DICRANOGRAPTUS. Hall. (Grapt. Quebec Group, p. 112.)

72. Sp. 1. *Dicranograptus ramosus.* Pl. 7, fig. 1.

The earlier or Llandeilo examples of this and the following species are remarkably spinose. As we ascend in the series of beds the spines seem to become shorter and less conspicuous. In the highest beds where these species are known they are destitute of spines. Localities—Crawfordsburn, Ballygrot, and Craigavad.

73. Sp. 2. *Dicranograptus Nicholsoni.* Hopk. Pl. 7, fig. 2. Locality—Ballygrot.

74. Sp. 3. *Dicranograptus formosus.* Hopk. Pl. 6, fig. 41. Localities—Coalpit Bay and Craigavad.

75. Sp. 4. *Dicranograptus Clingani.* Carr. Pl. 6, fig. 43. Locality—Not yet detected in Ireland.

76. Sp. 5. *Dicranograptus ziczac.* Lapw. Pl. 6, fig. 42*a*. (Catl. Western Scottish Fossils. Plate 3, fig. 77.)

Stem one-eighth of an inch in length, pointed; branches diverging at an angle of about 120 degrees, about an inch in length, bent into an elegant double curve, and forming a polypary of a vase-like form. Hydrothecæ 28 to 30 to the inch, seen in profile on the stem; invisible upon the branches. Allied to *Dicranograptus furcatus* of Hall. (Pal. New York, Vol. I. Plate 74, fig. 4.) Locality—Unknown in Ireland.

77. Var. *minimus.* Lapw. Pl. 6, fig. 42*b*.

Branches half an inch in length, forming a single gentle curve. Locality—Coalpit Bay.

Genus XII. DICELLOGRAPTUS. Hopkinson. (Geol. Mag. 1871. Pl. 1, p. 20.)

78. Sp. 1. *Dicellograptus elegans.* Carr. Pl. 7, fig. 8. Localities—Carnalea, Craigavad, and Coalpit Bay.

79. Sp. 2. *Dicellograptus Forchammeri.* Geinitz. Pl. 7, fig. 7. Localities—Carnalea, Ballygrot, and Coalpit Bay.

80. Sp. 3. *Dicellograptus Moffatensis.* Carr. Pl. 7, fig. 9. Locality—Ballygrot.

81. Var. *(a) divaricatus.* Hall. Pl. 7, fig. 10. Locality—Ballygrot.

82. Sp. 4. *Dicellograptus caduceus.* Lapw. Pl. 7, fig. 3. (Catl. Western Scottish Fossils. Pl. 4, fig. 83.)

Polypary consisting of two simple monoprionidian branches, which diverge

at a small angle, and are so curved that they cross and recross each other distally in the figure of 8. Axillary spine prominent, lateral spines undeveloped. Hydrothecæ 24 to 28 to the inch, of the form of those of *Dicellograptus elegans*, Carr. Sp. Locality—Ballygrot.

Genus XIII. DIDYMOGRAPTUS. M'Coy; (Pal. Foss., p. 9.)

83. Sp. 1. *Didymograptus superstes*. Lapw. Pl. 7, figs. 15 *a-b*. (Catl. Western Scottish Fossils. Pl. 3, fig. 74.)

Polypary consisting of two simple monoprionidian branches, of great length, attaining a maximum diameter of one-tenth of an inch, within the first three inches of their extent; broadly curved and including a ventral angle of about 120 degrees. Hydrothecæ 24 to the inch, inclined at an angle of 40 degrees, rapidly expanding in the direction of the apertural margin, which is deeply concave, and forms a broad triangular denticle.

Perfect specimens of this well-marked species are rarely detected; but the broad and slightly curved branches are numerous both in Scotland and Ireland in the typical Glenkiln Shales. This is in all probability the same species as that figured by Hall as *Graptolethus sagittarius*. (Pal. New York. Vol. I., Plate 74, fig. 1.) It is also associated here, as in North America, with a slender species which appears to be the same as *Didymograptus serratulus* (Hall). Localities—Ballygrot and Craigavad.

Genus XIV. LEPTOGRAPTUS. Lapworth. (Geol. Mag. 1873, p. 558.)

84. Sp. 1. *Leptograptus flaccidus*. Hall. Pl. 7, fig. 14. Localities—Carnalea, Orlock Point, and Ballygrot.

Genus XV. CŒNOGRAPTUS. Hall. (Modified.) (Hall, Annual Report, 1867, p. 179.)

So far as at present known this genus differs from *Pleurograptus* (Nich.), in the possession of an initial cross-bar, formed by the persistent sicula.

85. Sp. 1. *Cœnograptus gracilis*. Hall. Pl. 7, fig. 11. Localities—Ballygrot and Craigavad.

None of the Scottish examples of this species give evidence of having been

composed of four branches, as indicated in the American specimen figured by Hall. (Grapt. Quebec Group, p. 14.)

86. Sp. 2. *Cœnograptus surcularis.* Hall. Pl. 7, fig. 12. Locality—Ballygrot.

87. Sp. 3. *Cœnograptus pertenuis.* Lapw. Pl. 7, fig. 13. (Catl. Western Scottish Fossils, 1876. Pl. 3, figs. 66, 67.)

Polypary consisting of two simple or compound monoprionidian flexuous and extremely slender branches, proceeding in opposite directions from the central portion of a well-marked sicula. Hydrothecæ 16 to the inch, of the type of those of *Cœnograptus gracilis,*

The forms *C. explanatus*, and *C. nitidulus* figured by myself in the Catl. Western Scott. Fossils may be distinct species, or merely varieties of the present form. It will consequently be better to defer their description till this point has been satisfactorily determined. Locality—Ballygrot.

Genus XVI. THAMNOGRAPTUS. Hall.

88. Sp. 1. *Thamnograptus typus?* Hall. Pl. 7, fig. 16.

This form has only been procured in small fragments in the dark shales of County Down. It occurs locally in great profusion in the Glenkiln Beds of the South of Scotland. Some comparatively perfect and well preserved examples from these beds lately added to my collection, make it clear that different portions of the polypary are so distinct in their characters, that they have been considered as belonging to distinct species. *Rastrites Barrandei* of Hall is a true *Thamnograptus*, and ought probably to be referred to the present form. Localities—Ballygrot and Craigavad.

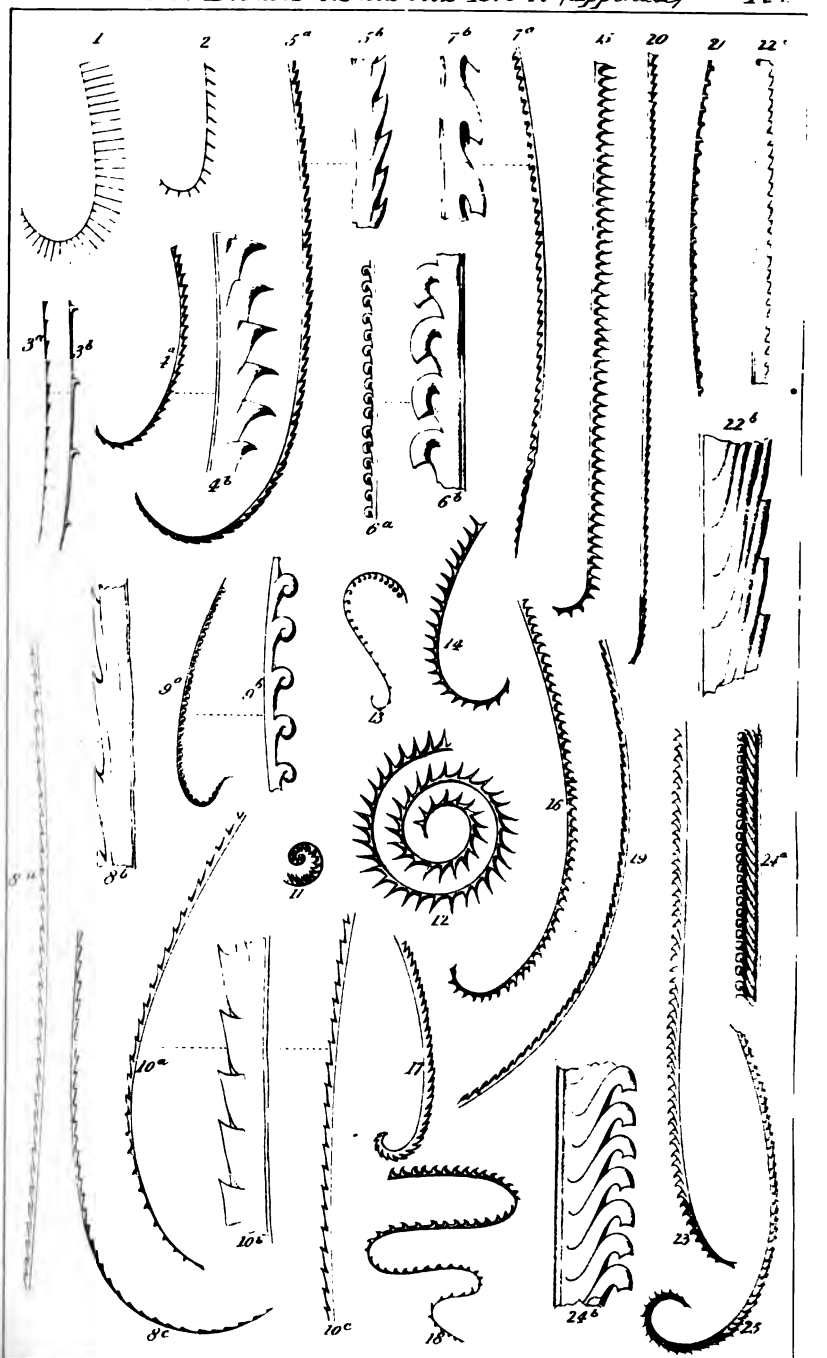
Genus XVII. DICTYONEMA. Hall. (Palaeontology of New York, Vol. ii., p. 174.)

89. Sp. 1. *Dictyonema Moffatensis.* Lapw. Pl. 7, fig. 17.

Polypary about an inch in length and one-third of an inch in maximum diameter, cupshaped, of an elongate semi-elliptical form; composed of slender, radiating, free, comparatively straight branches, with slightly crenulated margins; transverse dissepiments distant, scarcely visible;

Proximal portion of polypary prolonged into, and partially enveloped in a chitonous disc or plate.

All the specimens of this species known to me are in a very indifferent state of preservation, and the foregoing characters are all that can be made out with certainty. Locality—Carnalea.



SWANSTON & LAPWORTH - GRAPTOLITES OF CO. DOWN

Archer & Sons. Lith.

EXPLANATION OF PLATE V.

Fig. 1. *Rastrites peregrinus*, Barr.
„ 2. „ „ var. *hybridus*, Lapw.
„ 3. *Monograptus attenuatus*, Hopk.
„ 4*a*. „ *gregarius*, Lapw. 4*b*, portion enlarged.
„ 5*a*. „ *argutus*, Lapw. 5*b*, portion enlarged.
„ 6*a*. „ *lobiferous*, M'Coy. 6*b*, portion enlarged.
„ 7*a*. „ *runcinatus*, Lapw. 7*b*, portion enlarged.
„ 8*a*. „ *Sandersoni*, Lapw. 8*b*, portion enlarged; 8*c*, proximal extremity.
„ 9*a*. „ *exiguus*, Nich. 9*b*, portion enlarged.
„ 10*a*. „ *tenuis*, Portl. (proximal extremity). 10*c*, distal extremity; 10*b*, portion enlarged.
„ 11. „ *turriculatus*, Barr.
„ 12. „ *spiralis*, Geinitz.
„ 13. „ *crispus*, Lapw.
„ 14. „ *triangulatus*, Harkn.
„ 15. „ *Sedgwickii*, Portl.
„ 16. „ *communis*, Lapw.
„ 17. „ *fimbriatus*, Nich.
„ 18. „ *proteus*, Barr.
„ 19. „ *concinnus*, Lapw.
„ 20. „ *Hisingeri*, Carr. Var. *jaculum*, Lapw.
„ 21. „ *Barrandei*, Suess.
„ 22. „ *leptotheca*, Lapw. 10*b*, portion enlarged.
„ 23. „ *Riccartonensis*, Lapw.
„ 24*a*. „ *priodon*, Brown. 24*b*, portion enlarged.
„ 25. „ *cyphus*, Lapw.

EXPLANATION OF PLATE VI.

Fig. 1. *Monograptus Galaensis*, Lapw.
,, 2. ,, *M'Coyi*, Lapw.
,, 3*a*. ,, *lobiferous?* M'Coy. Var. *pandus* (proximal extremity); 3*b*, distal extremity; 3*c*, the same enlarged.
,, 4. *Cephalograptus cometa*, Geinitz.
,, 5. *Dimorphograptus Swanstoni*, Lapw.
,, 6. ,, *elongatus*, Lapw.
,, 7. *Diplograptus acuminatus*, Nich.
,, 8. ,, *confertus*, Nich.
,, 9. ,, *sinuatus*, Nich.
,, 10. ,, *tricornis*, Carr.
,, 11*a*. ,, *angustifolius*, Hall. 11*b*, portion enlarged.
,, 12. ,, *tamariscus*, Nich.
,, 13. ,, *dentatus*, Brogn.
,, 14. ,, *Hughesii*, Nich.
,, 15. ,, *insectiformis*, Nich.
,, 16. ,, *folium*, His.
,, 17*a*. ,, *truncatus*, Lapw. 17*b*, portion enlarged.
,, 18. ,, *foliaceus*, Murch.
,, 19. ,, *vesiculosus*, Nich.
,, 20. ,, *quadrimucronatus*, Hall.
,, 21. ,, *Whitfieldi*, Hall.
,, 22. ,, *mucronatus*, Hall.
,, 23. ,, *bimucronatus*, Nich.
,, 24*a*. *Glossograptus Hincksi*, Hopk. (Ventral aspect); 24*b*, lateral aspect.
,, 25. *Lasiograptus margaritatus*, Lapw. x. 2.
,, 26. ,, *Harknessi*, Nich. x. 2.
,, 27. *Clathrograptus cuneiformis*, Lapw. x. 2.
,, 28. *Retiolites fibratus*, Lapw. x. 2.
,, 29. ,, *perlatus?* Nich. Var. *obesus*, Lapw. x. 2.
,, 30. ,, ,, Var. *Daironi*, Lapw. x. 2.

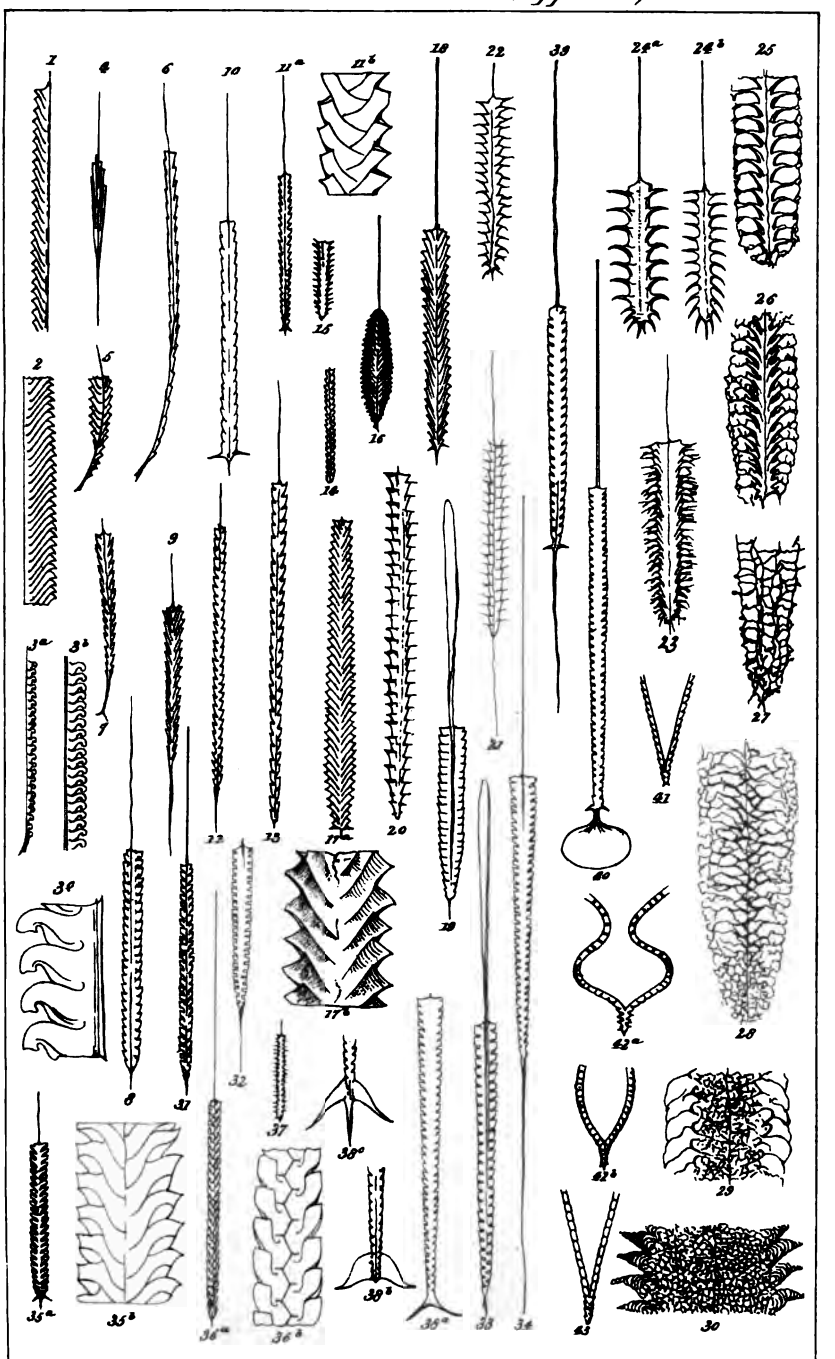


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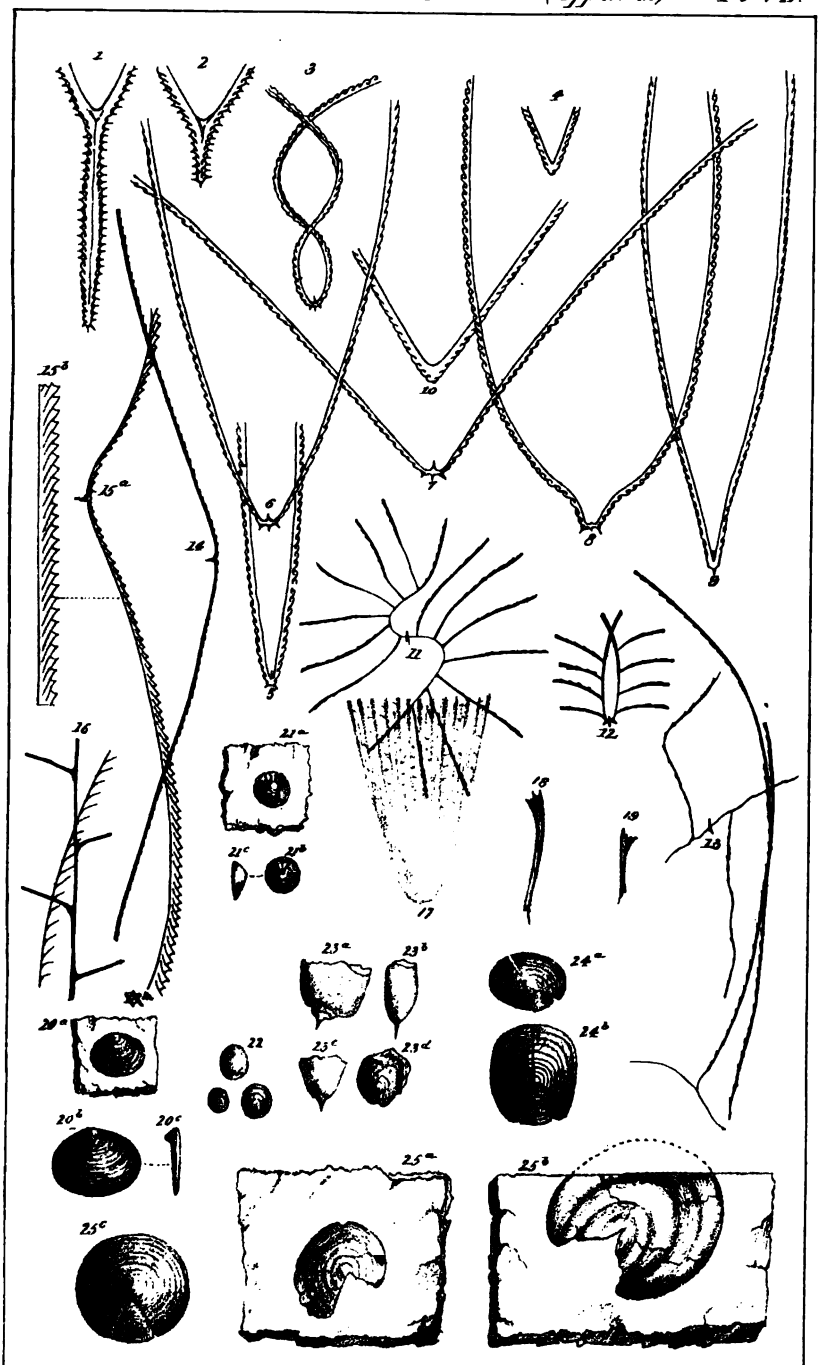
Fig. 31. *Climacograptus scalaris*, His.
,, ,, ,, Var. *normalis*, Lapw.
,, 32. ,, ,, Var. *rectangularis*, M'Coy.
,, 33. ,, ,, Var. *tubuliferus*, Lapw.
,, 34. ,, ,, Var. *caudatus*, Lapw.
,, 35*a*. *Climacograptus per-excavatus*, Lapw. 35*b*, portion enlarged.
,, 36*a*. ,, *Scharenbergi*, Lapw. 36*b*, portion enlarged.
,, 37 ,, *innotatus*, Nich.
,, 38*a*. ,, *bicornis*, Hall (typical form).
,, 38*b*. ,, ,, Var. *peltifer*.
,, 38*c*. ,, ,, Var. *tridentatus*.
,, 39. ,, *cælatus*, Lapw.
,, 40. ,, *Wilsoni*, Lapw.
,, 41. *Dicranograptus formosus*, Hopk.
,, 42*a*. ,, *zicsac*, Lapw. (typical form).
,, 42*b*. ,, ,, Var. *minimus*, Lapw.
,, 43. ,, *Clingani*, Carr.

EXPLANATION OF PLATE VII.

Fig. 1. *Dicranograptus ramosus*, Hall (stem only, older variety).
„ 2. „ *Nicholsoni*, Hopk.
„ 3. *Dicellograptus caduceus*, Lapw.
„ 4. „ *sextans*, Hall.
„ 5. „ *anceps*, Nich.
„ 6. „ *Morissi*, Hopk.
„ 7. „ *Forchammeri*, Geinitz.
„ 8. „ *elegans*, Carr.
„ 9. „ *Moffatensis*, Carr.
„ 10. „ „ var. *divaricatus*, Hall.
„ 11. *Cænograptus gracilis*, Hall.
„ 12. „ *surcularis*, Hall.
„ 13. *pertenuis*, Lapw.
„ 14. *Leptograptus flaccidus*, Hall.
„ 15*a*. *Didymograptus superstes*, Hall. 15*b*, portion of distal extremity.
„ 16. *Thamnograptus typus* (?), Hall.
„ 17. *Dictyonema Moffatensis*, Lapw.
„ 18. *Corynoides calycularis*, Nich.
„ 19. „ *curtus*, Lapw.
„ 20*a*. *Acrothele sp.*, *A. granulata*, Linars. 20*b c*, from original figure (Afdreg. ur. Geol., Stockholm, 1877).
„ 21*a*. *Acrotreta Nicholsoni*, Dav., Coalpit Bay. 21*c b*, from original figure of species (Geo. Mag., 1868, Pl. XVI).
„ 22. *Discina Portlockii*, Geinitz. Various examples.
„ 23. *Dawsonia campanulata*, Nich. Various examples.
„ 24*a*. *Peltocaris aptochoides*, Salter (Tieveshilly), slightly contorted specimen. 24*b*, from Salter's original figure (Q.J.G.S., Vol. VII., p. 391).
„ 25*a*. *Discinocaris Browniana*, H. Wood (Coalpit Bay). 25*b*, Dobbs Linn, Dumfries. 25*c*, from original figure of species (Q.J.G.S., Vol. XXII., Pl. XXV.).



C. LAPWORTH & W. SWANSTON, DEL. ARCHER & SONS, BELFAST.

SWANSTON & LAPWORTH - GRAPTOLITES OF CO DOWN.

[*Proceedings Belfast Naturalists' Field Club—Appendix*, 1879-1880.]

THE POST TERTIARY FORAMINIFERA OF THE NORTH EAST OF IRELAND.

By JOSEPH WRIGHT, F.G.S.

Hon. Assoc. of the Belfast Nat. Hist. and Phil. Soc.

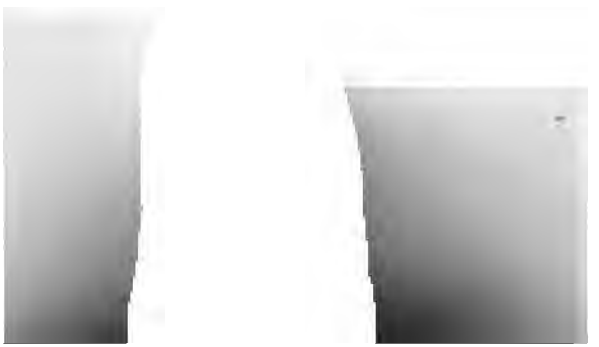
APPENDIX V.

ERRATA.

Page 160—"For "Nonionina asterizans, *F. & M.*," read "Nonionina stelligera, *D'Orb.*"

Page 162—For "Lagena marginata, var. trigono-marginata, *W. & J.*," read "Lagena marginata, var. trigono-marginata, *P. & J.*"

* Stewart—Fossils of the Estuarine Clays of Down and Antrim. Proc. Belfa Club, Vol. I., Appendix, p. 27, et seq.



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THE POST TERTIARY FORAMINIFERA OF THE NORTH EAST OF IRELAND.

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THE first record of Post Tertiary Foraminifera having been found in Ireland, was in a paper brought before our Club in 1874.* In it, the names of eleven species were given, as having been found in the Estuarine Clay at Magheramorne, County Antrim. That so few forms were then recorded was due to the circumstance, that the small quantity of Clay examined had been washed through sieves with the view of preserving the shells only, and in consequence, the great bulk of the Foraminifera were washed away with the fine material. Since then many of our Post Tertiary clays and gravels, have been carefully examined, and Foraminifera have been found to occur in abundance, not only in our Post Glacial beds, but also in the Boulder Clay; a deposit which until recently, and even yet by some, is presumed to contain no fossil remains. The majority of the Boulder Clays examined by me, yielded Microzoa, and it is possible that in some of the few localities where none were found, a more extended search would have led to different conclusions. At many places where the clay appeared unpromising, only small quantities were brought away for examination; and when they gave but little results, these spots were usually not revisited. That the Boulder Clay in many places was deposited in deep and quiet waters, reasonably favourable to the development of certain forms of marine life, may be inferred from the number of Foraminifera found at some stations; their tiny, delicate tests being as finely preserved as if recently dredged off our coast; and also

* Stewart—Fossils of the Estuarine Clays of Down and Antrim. Proc. Belfast Nat. Field Club, Vol. I., Appendix, p. 27, et seq.

from the fact, that *Leda pernula*, *minuta*, and *pygmea* —delicate little shells frequently occur, with both valves attached, leaving no doubt, but that they lived at those places where they are now found.

The Estuarine Clay is much newer than the Boulder Clay, and a long time must have elapsed between the termination of the one, and the commencement of the other. It was probably during this period that our Eskers were formed. This clay forms an extensive deposit along the valley of Belfast Lough, and in consequence of its vicinity to Belfast has been better examined than the equivalent clays at Strangford Lough and Lough Foyle. It occurs at Larne, underlying the gravel beds of the Curran,† and higher up Larne Lough, at Magheramorne, and occupies the greater part of the lowland on which Belfast is built. The brackish water forms, *Miliolina fusca*, *Trochammina inflata*, and *T. macrescens*, found both at King Street and beside the Cooke Statue, would lead us to infer, that when the clay was being deposited, Belfast Lough, except that it stood at a somewhat lower level, must have differed but little from its present condition. When making the new docks some years since, the shells in the Estuarine Clay were carefully tabulated by Mr. Stewart.‡ It is to be regretted that the clay was not at that time also examined for Foraminifera, as unusually fine sections were then exposed. A somewhat similar opportunity was lost for gaining a knowledge of our Boulder Clay species when, in 1842-3, the Clear Water Basin was being made, the Boulder Clay exposed during those excavations being exceptionally rich in shells, and if examined for Microzoa must have given most interesting results.

The Estuarine Clay is usually rich in Foraminifera. 42 species have been found in the clay at Blackstaff Bridge, Strangford Lough; 72 at Magheramorne, Larne Lough; and 98 at Limavady Station, Lough Foyle; these, as a rule, differ but little from our recent British species. At Limavady Station, *Ramulina lævis*, and *Lingulina tenera* occur, species which are not now found off our coast. *Lagena striato-punctata* occurs in abundance at the two latter places, and as this form is now one of our rarest British Rhizopods, we may infer that a long time must have elapsed since the clay was deposited.

Under the name of Raised Beaches, may be classed the shell deposit at Portrush, and the extensive gravel beds at the Curran, Larne; both are several feet above high water mark, and are more recent than the Estuarine Clays; at the latter place, as also at Kilroot, these Clays may be seen underlying the gravels. A large number of Foraminifera have been found at both stations.

† Gray, rudely-worked flints of the North of Ireland, chiefly in Antrim and Down. Jour Roy. His. and Archæol. Assoc. of Ireland. Fourth series, Vol. V., No. 39, p. 130.

‡ Fossils of the Estuarine Clays of Down and Antrim.

To my friend Mr. H. B. Brady, F.R.S., I am much indebted for the kind assistance rendered me in identifying the critical species; and to my friends Mr. W. Gray, M.R.I.A.; Mr. S. A. Stewart, F.B.S.E.; and Mr. W. Swanston, F.G.S., for the valuable help they gave me in supplying material for examination, from various localities not visited by myself.

The following notes on some of the forms found may be of interest:—The *Lagenæ* were among the most interesting, and occurred in great abundance, both in numbers and species, in the Estuarine Clay at Limavady Junction. All our recent British species of *Lagena*, except *crenata*, were found at this place. Trigonal varieties of our flat Entosolenian *Lagenas* were very numerous. All the British forms had here their three-sided representatives—viz., *marginata*, *lucida*, *ornata*, *lagenoides*, and *pulchella* (small), as well as two examples of a four-sided *marginata*. These, though curious and interesting, are after all but subvarietal modifications of the types, not even ranking as good varieties. I have recorded in the list *trigono-marginata*, *(trigono) oblonga*, and *trigono-ornata*, as being the best and most characteristic of these varieties.

LAGENA STRIATO-PUNCTATA, *P. and J.*

This species, now so rare in British water, is abundant in the Estuarine Clay at Magheramorne and Limavady Junction; also, a variety very small in size, and having only six longitudinal ribs.

LAGENA ASPERA, *Reuss.*

Lagena hispida, *Reuss.* Wright, Rec. Forams. of Down and Antrim—Belfast Nat. Field Club Rep., Appendix 1876-7, Pl. IV, fig. 7.

A small *Lagena*, covered with blunt spines, having a tendency at times to run in longitudinal lines.

LAGENA HISPIDA, *Reuss.*

Lagena Jeffreysii, Brady MS. Wright, Rec. Forams. of Down and Antrim—Belfast Nat. Field Club Rep., Appendix 1876-7, Pl. IV, fig. 15.

A few examples of this rare *Lagena* have been met with in the Estuarine Clay at Limavady Junction.

BULIMINA SUBTERES, *Brady.*

Brady, Notes on Reticularian Rhizopoda of the Challenger Expedition—Quart. Jour. Micr. Sci., Vol. XX, New Series.

Not unfrequent in the Estuarine Clay at Limavady Junction. This species has only within the last twelve months been recorded as recent on our coasts.

It has been dredged off the Shetlands, by Mr. Brady, off the Isle of Skye, by Mr. Robertson, and off Killybegs Harbour, County Donegal, by myself.

CASSIDULINA BRADYI, *Norman MS.*

A few examples of this crozier-shaped *Cassidulina* have been found in the Estuarine Clay at Limavady Junction.

DISCORBINA PARISIENSIS, *D'Orb.*

Wright, Rec. Forams. of Down and Antrim—Belfast Nat. Field Club Rep., Appendix 1876-7, Pl. IV, fig. 1, a b c (not fig. 2, a b c).

Not unfrequent in the Estuarine Clays at Magheramorne and Limavady Junction.

POLYSTOMELLA ARCTICA, *P. and J.*

This boreal species has been found at several localities in the Boulder Clay.

POST GLACIAL LOCALITIES.

1. Curran, Larne—Very extensive gravel beds; shells not unfrequent; Foraminifera plentiful.

2. Portrush—A considerable accumulation of broken shells in the hollows of the rocks above high-water mark on the shore convenient to the town of Portrush; Foraminifera plentiful.

Cooke's Statue, Wellington Place, Belfast—Estuarine Clay exposed at the opening of a sewer near the statue. The Foraminifera indicate brackish water conditions. All the species found, were also met with at the next station (Well, King Street), where also the following four species occurred—viz., *Miliolina oblonga*, *fusca*, *Polymorphina lactea*, and *Verneuilina polystropha*, these not having been found at this locality.

3. Well, King Street, Belfast—In the sinking for a well at Messrs. Swanston & Bones's, King Street, a few hundred yards from the last locality, the following beds were passed through :—

Estuarine Clay, 6 feet.	Estuarine Clay of the usual yellowish grey colour; Foraminifera rather common; more numerous than at Cooke's statue—*Miliolina oblonga*, *fusca*, *Trochammina squamata*, *inflata*, *macrescens*, *Lagena lucida*, *Polymorphina lactea*, *Verneuilina polystropha*, *Rotalia Beccarii*, *Polystomella crispa*, *striato-punctata*, *Nonionina depressula*.

Estuarine Clay, 22 feet.	Estuarine Clay of brownish colour and with offensive smell; Foraminifera very common—*Miliolina oblonga*, *Trochammina inflata* (very fine), *macrescens*, *Lagena lucida*, *Polymorphina lactea*, *Rotalia Beccarii*, *Polystomella striato-punctata*, *Nonionina depressula*.
Fine Sand, 24 feet.	Fine Sand; Foraminifera rare, possibly washed in from the overlying Estuarine Clay during the sinking of Well—*Trochammina inflata*, *Rotalia Beccarii*, *Polystomella striato-punctata*, *Nonionina depressula*.
Boulder Clay, 50 feet.	Clay very fine; Foraminifera very rare—*Rotalia Beccarii*, *Polystomella striato-punctata*.
Boulder Clay, 100 feet.	Boulder Clay as it usually occurs in our neighbourhood; Foraminifera plentiful—*Miliolina seminulum*, *Lagena Williamsoni*, *costata*, *lucida*, *melo*, *Globigerina bulloides*, *Cassidulina crassa*, *Rotalia Beccarii*, *Polystomella striato-punctata*, *Nonionina depressula*.

4. Estuarine Clay exposed in the deepening of Mr. MacLaine's dock Corporation Street, Belfast, 1879.

5. Magheramorne—Estuarine Clay on the West shore of Larne Lough—An extensive bank of this clay occurs along the shore, a few hundred yards south of the ferry-slip, close to the railway station. *Lagena striato-punctata*, now one of our rarest British *Lagenas*, occurs here in abundance. as also at Limavady Junction. Shells and Foraminifera are abundant.

6. Blackstaff Bridge, Strangford Lough, on Blackstaff River, about two miles South of Kirkcubbin and East of the road to Portaferry.

7. Limavady Junction, Lough Foyle—Estuarine Clay slightly above high water, close to the railway station. To Mr. Gray is due the credit of being the first to discover Estuarine Clay at this place, as also at Blackstaff Bridge. The clay is exceptionally rich in Foraminifera. A few Polycistinæ were found here.

BOULDER CLAY LOCALITIES.

1. Water Works, Belfast.—In excavating for the Clear Water Basin, in 1841-3, Boulder Clay was exposed, containing an abundance of shells, many of them water-worn.* The only material examined for Foraminifera was a little of the clay washed out of a few specimens of *Buccinum undatum*. Six species were found in this way, and considering the very small quantity of the clay examined, it may be considered fairly rich in Foraminifera.

2. Falls Park, Belfast, about 3 miles from the town, on the Falls Road.—Boulder Clay cut through by a small stream that flows through the Park. Mr. Stewart was the first to discover fossils at this place. The discovery was of special interest, as the clay contained several shells not usually met with in Boulder Clay, and in this respect appears very similar to the clay excavated some years ago in making the new basin at the Water Works locality, but which is not now accessible.

3. Castle-Espie, Co. Down.—Three miles from Comber, on the shore of Strangford Lough.—Thick beds of Boulder Clay resting on Carboniferous Limestone at the quarries and pottery works. The surface of the limestone is beautifully polished and grooved with ice action.

4. Cherry Valley, near Comber.—Cliffs of Boulder Clay, on the shore of Strangford Lough, 1 mile S.E. of Comber. No shells found, Foraminifera rare.

5. Ballyholme Bay, Co. Down, half a mile N.E. of Bangor.—Bank of Boulder Clay on the shore now covered by a sea-wall. Very little of the clay examined.

6. Knock Glen, Co. Down, near the Knock Railway Station.—Cliffs of Boulder Clay in the Glen, cut through by the stream Conswater. Shells rather rare, Foraminifera plentiful.

7. Woodburn Glen, 1 mile N.W. of Carrickfergus, Co. Antrim.—High banks of Boulder Clay at the side of the river Woodburn between the bridges. *Leda pernula* and *minuta*, with both valves attached, are not unfrequent. The clay here contains Foraminifera in great profusion; 50 species were de-

* See Portlock's Geol. Rep., Londonderry, &c., pp. 738-740.

tected; and as a large quantity of the clay has been examined the list from this locality gives a good record of the Foraminifera of the period. *Nonionina arctica* is not uncommon, now very rare as a British species, and only met with off our extreme Northern coast.

8. Black Head.—Boulder Clay on the shore, half a mile N. of the Head.

9. Gobbins, Islandmagee.—Boulder Clay on the shore, 1 mile South of the Headlands.

10 & 11. Ballyrudder, 2 miles N.W. of Ballygally Head.—Bank of Boulder Clay, also Glacial Gravels underlying the clay; both contain Foraminifera.

12. Bovevagh Church, Co. Derry, near the village of Dungiven.—Fine Clay containing *Turritella terebra* in profusion;* Foraminifera abundant, especially *Lagenas*.

Killyleagh, near Shrigley, Co. Down.—No shells found. Foraminifera as follows:—*Truncatulina lobatula*, *Globigerina bulloides*, *Nonionina depressula*, and *Discorbina globularis*. Only a small quantity of the clay examined.

Crumlin River, Co. Antrim, about midway between Crumlin and Lough Neagh.—A small patch of fine Clay a few yards in extent is here cut through by the Crumlin River. It contains very fragile examples of *Mytilus edulis* in profusion. The following Foraminifera have been found:—*Nonionina depressula*, *Globigerina bulloides*, *Discorbina globularis*, and *Textularia variabilis*. Mr. E. T. Hardman, F.G.S., has—in a paper published by him in the "Geological Magazine," of Dec., 1876—stated that these beds are lacustrine and of Pliocene age. Since that paper was published, Mr. W. Swanston, F.G.S.,† has made a careful examination of these clays, and the result has shown Mr. Hardman's conclusions were incorrect, the beds in question being Marine Boulder Clay.

Glacial Gravel beds occur at many places in the vicinity of Dublin. Three of these—viz.: Balscadden Bay, Ballybrack Station, and Ballyedmonduff—were visited by me in the Summer of 1879, and some of the gravels from each of these places brought away for examination. As no Microzoa have as yet been

* Portlock's Geol. Rep., Londonderry, &c., pp. 157-159.

† Supposed Fossiliferous Clays on the shore of Lough Neagh.—Geol. Mag., Feb., 1879.

recorded from these gravels, the following list of the Foraminifera found at the above localities may be of interest :—

LIST OF SPECIES.	Balscadden Bay.	Ballybrack Station.	Ballyedmonduff.
MILIOLINA trigonula, *Lamk.*	...	c	...
oblonga, *Montagu*	...	r	...
Brongniartii, *D'Orb.* ?	...	...	r
seminulum, *Linn.* ?	r	...	...
subrotunda, *Montagu*	..	r	...
TEXTULARIA variabilis, *Will.*	r	r	..
BULIMINA pupoides, *D'Orb.*	...	r	..
CASSIDULINA crassa, *D'Orb.*	r	r	...
LAGENA sulcata, *W. & J.*	...	r	...
Williamsoni, *Alcock*	c	c	...
striata, *D'Orb.*	r	r	...
margmata, *W. & J.*	...	r	...
lucida, *Will.*	r	...	...
melo, *D'Orb.*	...	r	...
squamosa, *Montagu*	r	...	...
hexagona, *Will.*	r	r	...
POLYMORPHINA lactea, *W. & J.*	c	...	...
compressa, *D'Orb.*	...	r	...
GLOBIGERINA bulloides, *D'Orb.*	r	...	..
TRUNCATULINA lobatula, *Walker*	r	r	...
ROTALIA Beccarii, *Linn.*	r	c	...
POLYSTOMELLA crispa, *Linn.*	...	r	r
striato punctata, *F. & M.*	c	v c	r
NONIONINA depressula, *W. & J.*	v c	v c	c

TABLE SHOWING THE DISTRIBUTION OF THE FORAMINIFERA IN THE POST GLACIAL DEPOSITS OF THE NORTH EAST OF IRELAND.

ABBREVIATIONS:—v. r., very rare; r., rare; c., common; v. c., very common.

LIST OF SPECIES.	Raised Beaches.		Estuarine Clays.					
	Curran, Larne.	Portrush.	Well—King Street, Belfast.	Docks, Belfast.	Magheramorne, Larne Lough.	Larne.	Blackstaff Bridge, Strangford Lough.	Limavady Station, Lough Foyle.
	1	2	3	4	5	6	7	8
CORNUSPIRA, *Schultze.*								
involvens, *Reuss*	...	r	...	r	c	r	vr	c
BILOCULINA, *D'Orb.*								
ringens, *Lamk.*	...	r	...	...	vr	vr	...	vr
depressa, *D'Orb.*	...	c	...	...	...	r	...	r
elongata, *D'Orb.*	...	r	...	...	...	...	...	r
MILIOLINA, *Will.*								
trigonula, *Lamk.*	r	vr	...	r	c	...	r	r
tricarinata, *D'Orb.*	r	...	...	...	c	r	...	c
oblonga, *Montagu*	...	r	r	...	c	r	r	r
Brongniartii, *D'Orb.*	r	...	...	...	r	...	r	r
seminulum, *Linn.*	r	c	...	r	vc	r	vc	vc
subrotunda, *Montagu*	r	vc	...	vr	c	r	c	vc
secans, *D'Orb.*	...	...	...	...	...	...	r	...
bicornis, *W. and J.*	r	c	...	...	vc	r	c	r
fusca, *Brady*	...	...	vr	...	...	...	...	...
SPIROLOCULINA, *D'Orb.*								
limbata, *D'Orb.*	r	...	...	r	c	...	r	...
planulata, *Lamk.*	...	...	...	...	c	vr	...	vr
canaliculata, *D'Orb.*	r	vr	...	r	r	...	...	...
TROCHAMMINA, *P. and J.*								
squamata, *P. and J.*	...	...	r	...	vr	vr	r	vr
inflata, *Montagu*	...	...	c	...	vr	r	r	vr
macrescens, *Brady*	...	...	r	...	...	r	...	vr
HAPLOPHRAGMIUM, *Reuss.*								
canariensis, *D'Orb.*	...	vr	...	...	vr	r	vr	vr
TEXTULARIA, *Defrance.*								
sagittula, *Defrance*	r	r	...	r	...	r	...	r
variabilis, *Will.*	c	vc	...	c	c	c	c	vc
difformis, *Will.*	r	c	...	...	...	r	...	r
pygmea, *D'Orb.*	...	...	...	..	...	r	...	...
VERNEUILINA, *D'Orb.*								
polystropha, *Reuss*	r	...	vr	r	r	...	..	vr

TABLE—(Continued.)

LIST OF SPECIES.	Raised Beaches.		Estuarine Clays.					
	Curran, Larne.	Portrush.	Well—King Street, Belfast	Docks, Belfast.	Magheramorne, Larne Lough.	Larne.	Blackstaff Bridge, Strangford Lough.	Limavady Station, Lough Foyle.
	1	2	3	4	5	6	7	8
BULIMINA, *D'Orb.*								
pupoides, *D'Orb.*	vr	vr	...	c	r	r	...	c
marginata, *D'Orb.*	r	vr	...	c	r	r	vr	r
ovata, *D'Orb.*	vc	c	...	vc	r	c	vr	vc
elegantissima, *D'Orb.*	..	...	...	vc	vr	c	r	c
subteres, *Brady MS.*	...	...	...	...	...	r	...	r
VIRGULINA, *D'Orb.*								
Schreibersii, *Czjzek*	vr	...	...	c	r	...	vr	r
BOLIVINA, *D'Orb.*								
punctata, *D'Orb.*	vr	...	...	...	r	r	vr	r
plicata, *D'Orb.*	r	r	...	r	c	vc	c	r
CASSIDULINA, *D'Orb.*								
lævigata, *D'Orb.*	r	vr	...	...	...	vr	...	r
crassa, *D'Orb.*	c	vc	...	...	vr	r	vr	vc
Bradyi, *Norman MS.*	...	...	..	...	...	...	...	vr
LAGENA, *W. and J.*								
sulcata, *W. and J.*	c	c	...	...	vr	c	vr	r
costata, *Will.*	vr	r	...	..	r	r	...	r
Williamsoni, *Alcock*	vc	vc	...	...	vc	vc	vr	vc
Lyellii, *Seguenza*	...	...	...	...	vr	...	...	r
lævis, *Montagu*	vc	vc	...	c	vc	c	r	vc
gracillima, *Segnenza*	r	...	...	r	vr	...	vr	r
globosa, *Montagu*	r	r	...	...	r	r	vr	r
striata, *D'Orb.*	r	r	...	c	c	r	vr	c
gracilis, *Will.*	...	...	...	...	...	...	...	r
striato-punctata, *P. and J.* ...	...	...	...	...	vc	...	...	c
semistriata, *Will.*	r	r	...	r	r	r	c	r
aspera, *Reuss*	...	vr	..	...	...	...	...	r
hispida, *Reuss*	...	...	...	...	...	...	...	vr
caudata, *D'Orb.*	c	c	...	...	c	r	r	c
marginata, *W. and J.*	c	c	...	...	r	c	r	vc
var. trigono-marginata, *P. and J.*	vr	...	...	...	vr	vr	...	r
lucida, *Will.*	c	r	r	vc	vc	c	c	vc
var. (trigono) oblonga, *Seguenza*	vr	...	...	...	r	r	...	r
pulchella, *Brady*	...	...	...	...	...	...	...	vr
ornata, *Will.*	c	vr	...	...	...	r	...	vc
var. trigono-ornata, *Siddall* ...	...	...	...	..	...	...	...	vr

TABLE—(Continued).

LIST OF SPECIES.	Raised Beaches.		Estuarine Clays.					
	Curran, Larne.	Portrush.	Well—King Street, Belfast	Docks, Belfast.	Magheramorne, Larne Lough.	Larne.	Blackstaff Bridge, Strangford Lough.	Limavady Station, Lough Foyle.
	1	2	3	4	5	6	7	8
LAGENA, *W. & J.*								
lagenoides, *Will.*	...	...	...	...	..	vr	...	c
melo, *D'Orb.*	vc	c	...	...	r	vc	c	vc
squamosa, *Montagu*	vr	vc	...	...	c	vr	...	r
hexagona, *Will.*	r	c	...	...	c	c	...	c
RAMULINA, *Jones.*								
lævis, *Jones*	...	...	...	...	vr	...	...	vr
LINGULINA, *D'Orb.*								
carinata, *D'Orb.*	...	...	.	...	...	...	...	r
tenera, *Bornemann*	...	...	...	...	...	...	...	vr
NODOSARIA, *Lamk.*								
raphanus, *Linn.*	...	..	...	...	...	...	...	vr
scalaris, *Batsch.*	r	vr	...	...	vr	r	...	r
pyrula, *D'Orb.*	r	vr	...	...	r	r	...	r
radicula, *Linn.*	...	...	..	...	...	vr	...	r
DENTALINA, *D'Orb.*								
communis, *D'Orb.*	vr	...	...	...	...	...	...	r
guttifera, *D'Orb.*	...	...	...	...	...	...	...	r
obliqua, *D'Orb.*	...	...	...	...	vr	vr	...	r
VAGINULINA, *D'Orb.*								
legumen, *Linn.*	...	...	...	...	...	r	...	vr
MARGINULINA, *D'Orb.*								
lituus, *D'Orb.*	...	...	...	...	...	...	...	r
CRISTELLARIA, *Lamk.*								
rotulata, *Lamk.*	vr	...	...	...	vr	vr	...	vr
crepidula, *F. & M.*	vr	vr	...	...	...	...	...	vr
POLYMORPHINA, *D'Orb.*								
lactea, *W. & J.*	r	r	r	vr	vr	r	c	r
gibba, *D'Orb.*	c	vc	...	...	r	c	c	r
oblonga, *Will.*	r	vr	..	...	vr	vr	...	r
compressa, *D'Orb.*	vr	r	...	...	r	r	r	r
concava, *Will.*	...	...	...	...	...	...	...	r
myristiformis, *Will.*	...	r	...	...	...	...	...	vr
UVIGERINA, *D'Orb.*								
angulosa, *Will.*	vr	c	...	...	vr	r	vr	r
ORBULINA, *D'Orb.*								
universa, *D'Orb.*	...	r	...	...	...	...	...	r

TABLE—(Continued).

LIST OF SPECIES.	Raised Beaches.		Estuarine Clays.					
	Curran, Larne.	Portrush.	Well, King Street, Belfast.	Docks, Belfast.	Magheramorne, Larne Lough.	Larne.	Blackstaff Bridge, Strangford Lough.	Limavady Station, Lough Foyle.
	1	2	3	4	5	6	7	8
GLOBIGERINA, *D'Orb.*								
bulloides, *D'Orb.*	vc	vc	...	...	r	vc	vr	vc
inflata, *D'Orb.*	...	c	...	...	...	...	...	r
SPIRILLINA, *Ehrenb.*								
vivipera, *Ehrenb.*	vr	...	...	...	c	...	...	r
PATELLINA, *Will.*								
corrugata, *Will.*	vr	vr	...	..	c	r	r	r
DISCORBINA, *P. & J.*								
rosacea, *D'Orb.*	...	...	...	...	r	...	...	r
globularis, *D'Orb.*	c	r	...	vr	r	c	vr	c
Parisiensis, *D'Orb.*	...	...	...	...	r	...	...	r
Bertheloti, *D'Orb.*	...	...	...	...	...	...	..	vr
PLANORBULINA, *D'Orb.*								
Mediterranensis, *D'Orb.*	r	r	...	...	r	c	r	r
TRUNCATULINA, *D'Orb.*								
lobatula, *Walker*	vc	vc	...	r	r	c	c	r
refulgens, *Montfort*	...	...	...	..	vr	...	vr	...
TINOPORUS, *Montfort.*								
lævis, *P. & J.*	..	vr	..	...	...	...	...	vr
lucidus, *Brady MS.*	..	...	...	...	vr	vr	r	vr
PULVINULINA, *P. & J.*								
auricula, *F. & M.*	...	r	...	...	...	vr	...	c
ROTALIA, *Lamk.*								
Beccarii, *Linn.*	r	r	vc	vc	c	vc	vc	vc
nitida, *Will.*	r	r	..	...	r	r	r	c
NONIONINA, *D'Orb.*								
umbilicatula, *Montagu*	vr	...	...	...	vr	...	..	...
depressula, *W. & J.*	c	c	vc	vc	c	vc	vc	vc
turgida, *Will.*	c	r	...	...	r	r	vr	c
scapha, *F. & M.*	...	r	...	...	vr	vr	vr	vr
asterizans, *F. & M.*	...	...	...	...	r	...	...	r
POLYSTOMELLA, *Lamk.*								
crispa, *Linn.*	vc	c	c	r	vc	vc	vc	c
striato-punctata, *F. & M.* ...	c	r	vc	r	r	vc	c	vc

TABLE SHOWING THE DISTRIBUTION OF THE FORAMINIFERA IN THE BOULDER CLAY DEPOSITS OF THE NORTH EAST OF IRELAND.

LIST OF SPECIES.	Waterworks, Belfast.	Falls Park, Belfast.	Castle-Espie, Co. Down.	Cherry Valley, Co. Down.	Ballyholme Bay, Co. Down.	Knock Glen, Co. Down.	Woodburn Glen, Carrickfergus.	Black Head, Co. Antrim.	Gobbins, Islandmagee.	Ballyrudder, Co. Antrim.	Ballyrudder, Co. Antrim (gravel).	Bovevagh Church, Co. Derry.
	1	2	3	4	5	6	7	8	9	10	11	12
CORNUSPIRA, *Schultze.*												
involvens, *Reuss*	...	...	...	...	...	...	r	...	...	...	..	...
BILOCULINA, *D'Orb.*												
ringens, *Lamk.*	...	r	r	...	...	r	vc	c	...	...	vr	r
depressa, *D'Orb.*	r	...	...	...	..	...	vr	...	...	...	...	...
elongata, *D'Orb.*	...	...	...	...	...	...	r	c	...	...	...	..
MILIOLINA, *Will.*												
tricarinata, *D'Orb.*... ...	...	..	...	...	...	...	c	...	...	...	...	...
oblonga, *Montagu*	r	...	...	...	...	...	c	...	...	..	vr	...
Brongniartii, *D'Orb.* ...	...	..	...	...	...	...	r	...	...	...	...	...
seminulum, *Linn.*	r	..	...	...	...	...	r	...	...	...	...	...
subrotunda, *Montagu* ..	...	c	...	...	..	r	vc	vc	...	...	vr	c
SPIROLOCULINA, *D'Orb.*												
limbata, *D'Orb.*	...	vr	...	...	..	...	...	...	...	...	...	...
HAPLOPHRAGMIUM, *Reuss.*												
canariensis, *D'Orb.* ...	...	...	...	...	...	...	vr	...	...	...	...	...
TEXTULARIA, *Defrance.*												
sagittula, *Defrance* ...	...	...	...	...	...	...	vr	...	...	...	r	...
variabilis, *Will.*	...	...	r	...	...	r	r	vr	...	r	r	c
difformis, *Will.*	...	...	...	...	...	vr	...	...	...	...	...	r
BULIMINA, *D'Orb.*												
pupoides, *D'Orb.*	...	r	...	...	...	...	r	...	...	...	r	c
marginata, *D'Orb.*	...	...	...	..	...	vr	r	...	...	...	...	r
ovata, *D'Orb.*	...	...	...	...	...	r	vr	...	...	...	vr	r
elegantissima, *D'Orb.* ...	...	...	...	...	...	vr	...	...	...	...	vr	...
VIRGULINA, *D'Orb.*												
Schreibersii, *Czjzek* ...	...	...	...	...	...	...	vr	...	...	...	...	...
BOLIVINA, *D'Orb.*												
punctata, *D'Orb.*	...	...	..	...	...	...	...	...	...	...	..	vr
plicata, *D'Orb.*	...	r	...	...	...	...	vr	...	...	...	...	vr

TABLE—(Continued).

LIST OF SPECIES.	Waterworks, Belfast.	Falls Park, Belfast.	Castle-Espie, Co. Down.	Cherry Valley, Co. Down.	Ballyholme Bay, Co. Down.	Knock Glen, Co. Down.	Woodburn Glen, Carrickfergus.	Black Head, Co. Antrim.	Gobbins, Islandmagee.	Ballyrudder, Co. Antrim.	Ballyrudder, Co. Antrim (gravel).	Bovevagh, Church, Co. Derry.
	1	2	3	4	5	6	7	8	9	10	11	12
CASSIDULINA, *D'Orb.*												
lævigata, *D'Orb.* ...	...	vr	...	...	...	...	vr	...	..	...	...	...
crassa, *D'Orb.* ...	...	vc	r	...	...	vc	vr	vr	...	...	r	r
LAGENA, *W. and J.*												
sulcata, *W. and J.* ...	...	r	...	...	...	r	r	...	...	...	r	vr
costata, *Will.* ...	...	...	...	...	...	vr	r	vr	...	...	...	...
Williamsoni, *Alcock* ...	...	c	r	...	r	r	vc	r	r	r	c	c
lævis, *Montagu* ...	...	...	r	...	...	vr	vr	...	vr	...	r	c
gracillima, *Seguenza* ...	...	vr	...	...	...	r	r	...	...	...	...	...
globosa, *Montagu* ...	...	...	...	...	...	vr	vr	r	...	...	...	r
striata, *D'Orb.* ...	...	r	...	...	...	vr	r	...	...	...	vr	c
gracilis, *Will.* ...	...	...	...	...	...	...	vr	...	...	...	...	...
semistriata, *Will.* ...	...	r	...	...	...	...	vr	...	...	r	...	vr
caudata, *D'Orb.* ...	...	r	...	...	...	r	r	...	vr	...	r	r
marginata, *W. and J.* ...	...	c	c	...	...	c	c	...	...	c	c	r
var. trigono-marginata, *W.*	...	...	...	...	vr	...	...	...	...	...	...	...
lucida, *Will.* [*and J.*]	...	r	r	...	...	vr	c	c	...	...	c	c
melo, *D'Orb.* ...	...	r	r	...	...	r	r	r	vr	vr	c	r
squamosa, *Montagu* ...	...	...	...	...	...	r	vr	...	...	...	...	...
hexagona, *Will.* ...	...	c	...	...	...	...	...	..	...	...	...	c
NODOSARIA, *Lamk.*												
scalaris, *Batch.* ...	...	vr	...	...	...	...	...	...	...	...	...	...
VAGINULINA, *D'Orb.*												
legumen, *Linn.* ..	...	...	...	...	...	...	vr	...	...	...	..	...
CRISTELLARIA, *Lamk.*												
crepidula, *F. and M.* ...	...	...	...	...	...	...	...	..	...	...	...	vr
POLYMORPHINA, *D'Orb.*												
lactea, *W. and J.* ...	...	c	...	...	...	r	vc	c	r	...	vr	r
fusiformis, *Rœmer* ..	...	...	...	...	...	...	r	...	...	...	. .	...
gibba, *D'Orb.* ...	...	...	...	...	...	...	vr	...	...	...	...	...
compressa, *D'Orb.* ...	...	c	c	...	...	vr	r	...	...	r	...	...
UVIGERINA, *D'Orb.*												
angulosa, *Will.* ...	...	r	.	...	...	..	r	...	...	...	r	r
ORBULINA, *D'Orb.*												
universa, *D'Orb.* ...	...	...	...	...	...	...	...	...	...	...	r	...

TABLE—(Continued).

LIST OF SPECIES.	Waterworks, Belfast.	Falls Park, Belfast.	Castle-Espie, Co. Down.	Cherry Valley, Co. Down.	Ballyholme Bay, Co. Down.	Knock Glen, Co. Down.	Woodburn Glen, Carrickfergus.	Black Head, Co. Antrim.	Gobbins, Islandmagee.	Ballyrudder, Co. Antrim.	Ballyrudder, Co. Antrim (gravel).	Bovevagh Church, Co. Derry.
	1	2	3	4	5	6	7	8	9	10	11	12
GLOBIGERINA, *D'Orb.*												
bulloides, *D'Orb.*	...	c	c	r	..	c	r	vr	...	r	c	c
PATELLINA, *Will.*												
corrugata, *Will.*	...	vr	...	...	...	vr	vr	...	...	...	...	...
DISCORBINA, *P. and J.*												
rosacea, *D'Orb.*	...	...	...	...	...	...	...	...	..	...	vr	...
globularis, *D'Orb.* ...	...	...	...	...	...	vr	r	...	...	...	...	r
PLANORBULINA, *D'Orb.*												
Mediterranensis, *D'Orb.* ...	...	...	...	...	...	...	vr	...	..	..	..	...
TRUNCATULINA, *D'Orb.*												
lobatula, *Walker*	r	c	...	r	...	c	vr	...	vr	r	r	r
ROTALIA, *Lamk.*												
Beccarii, *Linn.*	r	c	r	r	...	c	r	vr	vr	c	r	vr
nitida, *Will.*	...	...	...	r	...	...	...	...	...	...	...	...
NONIONINA, *D'Orb.*												
depressula, *W. and J.* ...	...	vc	vc	r	c	vc	vc	vc	c	vc	vc	vc
scapha, *F. and M.* ..	...	..	...	...	...	...	vr	...	...	...	...	...
POLYSTOMELLA, *Lamk.*												
crispa, *Linn.*	r	...	...	...	...	..	c	...	r	r	...	r
striato-punctata, *F. and M.*	...	vc	...	r	...	...	c	...	...	...	...	vc
arctica, *P. and J.* ...	...	c	...	...	...	...	c	r	r	...	...	...

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THE MOLLUSCA OF THE BOULDER CLAY OF THE NORTH EAST OF IRELAND.

BY S. A. STEWART,

Fellow of the Botanical Society of Edinburgh.

AMONGST the British deposits of the Glacial Period the Boulder Clay is undoubtedly the most important. Though of small magnitude, as compared with beds of greater antiquity, yet it exhibits such remarkable characters as render it unique, and in the entire sedimentary series there are no rocks which can be classed as altogether similar. Attempts have been made to prove a succession of Glacial Epochs in not only Secondary, but also Palæozoic times; but if Glacial conditions ever prevailed during those eras, only comparatively faint and questionable evidences remain to us, and the epoch to which the Boulder Clay belongs must still be regarded as *the* Glacial Epoch.

The structure and physical characters of the Boulder Clay, as it occurs in this district, are so distinct that it may be recognised without difficulty, and it has been accurately described by successive writers from the time of Portlock down to the present. It is a stiff, compact, unstratified clay, usually reddish brown, but sometimes blue, very tenacious when moist, and containing numerous boulders, as well as many smaller stones. These boulders and stones have their angles more or less rounded off, their surfaces being in most cases scratched or striated, and such as admit of polishing—especially the limestones —are often beautifully polished. The larger portion of the stones have been derived from local rocks; but such as are not from the immediate vicinity have been transported from somewhere to the north, sometimes east of north, and often to the west of north.

The Molluscan shells occurring in the Boulder Clay are not numerous; in most cases they are only found by patient searching, and then only in a fragmentary condition; but in a few instances they are less rare, and include specimens in a perfect state. *Astarte sulcata*, A. *elliptica*, A. *compressa*, and *Leda pernula* are the prevailing and characteristic forms; the most widely diffused and the most numerous in examples. Fragments of these shells are to be found almost everywhere, and perfect shells are frequently met with. *Leda pygmæa* is also remarkable. Though a very small and fragile shell, it is usually found in a perfect state, with the two valves united. The presence of perfect shells of *Leda* was known long since to General Portlock, and forced him to the same conclusion as arrived at by the Author, that the Boulder Clay is a marine sedimentary deposit. The absence of stratification has led most geologists to the conclusion that the Boulder Clay is an accumulation resulting from land ice, and the occurrence in it of so many marine shells seems to have been either unknown or overlooked. The fauna of the Boulder Clay is not by any means rich, and this is what we might expect from the rigour of the climate of that period. Nevertheless it is a marine fauna; and there is unquestionable evidence in the case of several of the species that they truly belong to the deposit, and were not drifted into their present position from a distant locality, nor yet are they fossils derived from an older bed.

From what has been stated, it will be seen that we must account for the want of stratification in some other way than the land-ice theory, as the presence of even one marine shell unquestionably belonging to the deposit renders that theory invalid. The supposition of a general ice-cap can derive no support from the Boulder Clay. The underlying rocks are very often glaciated, and bear striæ which tell of ice that was moving over them from the north, and this is corroborated by the stones contained in the clay, which also tend to show a similar ice movement. We must, therefore, conclude that the clay was rapidly deposited from water-borne ice, and that the ice, with its burthen of clay and stones, was impelled by currents having a more or less southerly direction. On the floor of the sea lived a scanty boreal fauna. Many of the shells were broken into fragments by the ice grounding in the shallow waters, or by the dropping down of large boulders, and the result that remains is the unstratified till, with its occasional entire shells and more numerous fragments.

The Boulder Clay forms the subsoil over the greater part of our district, adding much to the fertility of the land. It is best seen in river banks, because the streams have made sections of the strata, and thereby exposed it to our view. It has, consequently, been often considered as only, or mainly, deposited in sheltered hollows; but it is found that where artificial cuttings have been

made, as in quarries or roads, they discover the Boulder Clay equally on the hill-side or level plain.

The Glacial Drift has been divided by geologists of eminence into three stages—First, the lower Boulder Clay, the most extensive, and displaying the greatest evidence of Arctic conditions; second, certain sands and gravels deposited under milder conditions of climate; and third, the upper Boulder Clay, which is said to indicate a recurrence of Arctic conditions. My researches do not lead me to accept this classification. I am unable to separate it into upper and lower, and the gravels said to be interglacial seem to be only local modifications of the deposits of one continuous period, during which Arctic, or semi-Arctic, conditions prevailed over this country without any interval of relaxation. The sands and gravels at Ballyrudder, near Glenarm, which Professor Hull regards as interglacial,* yield abundant specimens of a fauna as Arctic in character as any portion of the Boulder Clay, and are overlaid by an unstratified clay which I cannot distinguish from deposits which are said to be lower Boulder Clay.

FOSSIL LOCALITIES.

BELFAST WATERWORKS.

The Boulder Clay at this locality has yielded a much larger number of Molluscan remains than any other similar deposit in Ireland. Forty-seven different shells are enumerated in the subjoined list, mostly collected in 1842-43 by the late Messrs. James Bryce, F.G.S., and George C. Hyndman, who published their results in Portlock's Report on the Geology of Londonderry, pp. 738-9. A further and more complete list of the shells of the Waterworks was given by Mr. Bryce in the "Philosophical Magazine," vol. 26, pp. 433-5. This deposit of Boulder Clay was proved to be undoubtedly rich in fossils; but it is not, however, to be inferred that, as compared with other localities, this spot was so excessively rich as would appear from the lists. Mr. Bryce states that about ten thousand cubic yards of the clay were removed during the excavations for the lower reservoir, and that the great number of shells obtained was due to the watchfulness of various collectors. In other instances only the surface of a limited section can be examined, and it will be seen that no fair

* Hull—Physical Geology and Geography of Ireland, p. 88.

comparison is possible. The four species added by me to the list published by Bryce were obtained by close scrutiny of material collected by the late Mr. Hyndman, the deposit being now inaccessible.

WOODBURN, CO. ANTRIM.

A deep bed of Boulder Clay is, for a considerable distance, cut through by the Woodburn River, at rather more than a mile north-west of Carrickfergus. This bed has yielded ten species of shells, and is notable for the occurrence of three species of *Leda*, many of the specimens being in a perfect state. *Trophon latericeus* was also found here.

FALLS PARK, BELFAST.

This locality is close to the town, opening to the Falls Road. The clay here would be quite as rich in fossils as that of the Waterworks if sufficient material were available. The beds are exposed only in the low banks of the small stream that flows through the park, and, consequently, the search for fossils can only be conducted by examining the surfaces of the sections. Seven species have been collected here, all of northern types, including *Astarte triangularis* and *Trophon Gunneri*, which are not recorded from any of the other localities. Fragments of *Balani* are frequent here, as in all the fossil localities I have examined, except Bovevagh.

BANGOR, COUNTY DOWN.

The Boulder Clay is seen in a high bank on the shore at Ballyholme, half a mile north-east of Bangor. Six species of the usual northern forms have been found in this spot. The rocks, where denuded of clay, are seen to be finely glaciated.

KNOCK, COUNTY DOWN.

A small stream (Connswater) has exposed the Boulder Clay in the high banks of Knock Glen, near the Knock railway station. Shells are not plentiful at this place; four species only have been found. *Leda minuta* and *Leda pygmæa* are not rare; they usually occur quite perfect.

CASTLE-ESPIE, COUNTY DOWN.

Three miles from Comber, on the shore of Strangford Lough, there is an extensive deposit of Boulder Clay resting on Carboniferous Limestone, which is beautifully polished and striated. Shells are very scarce in the clay. *Astarte sulcata* and a *Leda* were the only forms recognised.

CRUMLIN RIVER, COUNTY ANTRIM.

The Boulder Clay is exposed at several points on the Crumlin River, and this locality is remarkable for the occurrence of a small patch, not much over a square yard in extent, as far as seen, but crowded with shells of *Mytilus edulis* in a very fragile condition. This bed is exposed on the south bank of the river, at about midway between Crumlin and the shore of Lough Neagh. It was discovered by Mr. E. T. Hardman, F.G.S., who supposed the shells to represent a species of *Unio*, and the clay to be a lacustrine deposit of Pliocene age.* Mr. W. Swanston, F.G.S., has shown† that the shells are really the tests of the common mussel, and that the clay is truly glacial. No other shells have been found associated with the *Mytilus*, but Mr. Joseph Wright, F.G.S., has found several species of Foraminifera.

BOVEVAGH RIVER, COUNTY DERRY.

This bed is situated not far from the village of Dungiven, and was described by Portlock in the Report on the Geology of Londonderry, page 159. It is only remarkable on account of the occurrence, in a very limited exposure of great numbers of *Turretella terebra*, a shell that seems to be rare in the Boulder Clay elsewhere in Ireland.

BALLYRUDDER, COUNTY ANTRIM.

A most interesting glacial bed is to be seen at Ballyrudder, about six miles north of Larne, on the road to Glenarm. This deposit was examined long since by Dr. Jeffreys and the late Mr. George C. Hyndman, who published, in the Report of the British Association for 1859, a list of the shells which they found, at the same time intimating that their search was not exhaustive. It has also been recently mentioned by Mr. T. Mellard Reade, F.G.S., in Vol. XXXV. of

* Geol. Mag., Dec. 2. Vol. 8, p. 556.
† Geol. Mag., Dec. 2, Vol. 6, No. II.

the Quarterly Journal of the Geological Society of London. Mr. Reade apprehended the importance of this bed, and in his communication gives a section and interesting notes. The deposit at this place is well exposed, and differs much from those of the foregoing localities. It consists of gravel, with subordinate layers of sand and clay, the combined thickness of this series being about twenty feet. The gravels are overlaid by a bed of ordinary Boulder Clay, about ten feet thick. The base is not seen. The gravels can be traced along the road for some fifty or sixty yards, and yield a number of very interesting shells, univalves preponderating.

LIST OF THE MOLLUSCA OF THE NORTH-EAST OF IRELAND.

I gratefully acknowledge that in compiling this list I received valuable assistance from Dr. J. Gwynn Jeffreys, F.R.S., who, with his usual kindness, undertook the identification of such of my shells as were in any degree doubtful.

RHYNCHONELLA PSITTACEA. *Chemnitz.*

Ballyrudder, County Antrim, Jeffreys and Hyndman. Report Brit. Assoc., 1859.

ANOMIA EPHIPPIUM, *Linn.*

Belfast Waterworks. Bryce. Phil. Mag., Vol. XXVI., p. 433; Ballyrudder. Jeffreys and Hyndman.

OSTREA EDULE, *Linn.*

Belfast Waterworks. Bryce.

PECTEN MAXIMUS, *Linn.*

Belfast Waterworks. Bryce.

MYTILUS EDULIS, *Linn.*

Woodburn, Bangor, Ballyrudder, S. A. S.; Belfast Waterworks, Bryce; Ballyrudder, Jeffreys and Hyndman. In great abundance in a bed of stiff blue Boulder Clay on the banks of the Crumlin River.

MODIOLARIA MARMORATA, *Forbes.*

Ballyrudder, County Antrim, S. A. S.

NUCULA NUCLEUS, *Linn.*

Waterworks, Bryce; Woodburn, S. A. S.

LEDA PYGMÆA, *Munst.*

Knock, Woodburn, Ballyrudder, S. A. S. This tiny, delicate shell is not uncommon, and almost invariably found in a perfect state.

LEDA MINUTA, *Muller.*

Knock, Waterworks, Woodburn, Ballyrudder, S. A. S. Similarly to the preceding species, this shell is very often met with in a perfect state.

LEDA PERNULA, *Muller.*

Belfast Waterworks, Bryce; Falls Park, Waterworks, Woodburn, S. A. S. My largest specimen attained a breadth of one inch.

PECTUNCULUS GLYCIMERIS, *Linn.*

Belfast Waterworks, Bryce.

ARCA PECTUNCULOIDES, *Sacchi.*

Belfast Waterworks, S. A. S.

ARCA LACTEA, *Linn.*

Belfast Waterworks, Bryce.

LUCINA BOREALIS, *Linn.*

Woodburn, Ballyrudder, S. A. S.

CARDIUM ECHINATUM, *Linn.*

Belfast Waterworks, Bryce.

CARDIUM NODOSUM, *Turton.*

Belfast Waterworks, Bryce.

CARDIUM EDULE, *Linn.*

Belfast Waterworks, Bryce.

ASTARTE SULCATA, *Da Costa.*

Belfast Waterworks, Bryce; Bangor, Castle-Espie, Knock, Waterworks, Woodburn, Falls Park, S. A. S. This species and the following variety are to be found in almost every Bed of Boulder Clay. Frequently the shells are entire, but more commonly fragmentary. In the deposit at the Waterworks it is especially abundant.

ASTARTE SULCATA *var.* ELLIPTICA, *Brown.*

Belfast Waterworks, Bryce; Ballyrudder, Jeffreys and Hyndman; Knock, &c., S. A. S.

ASTARTE COMPRESSA, *Montagu.*

Belfast Waterworks, Bryce; Bangor, Falls Park, Woodburn, S. A. S.

ASTARTE COMPRESSA *var.* GLOBOSA, *Moller.*

Ballyrudder, Jeffreys and Hyndman.

ASTARTE TRIANGULARIS, *Montagu.*

I found one specimen only in the Boulder Clay at the Falls Park.

ASTARTE BOREALIS, *Chemnitz.*

Belfast Waterworks, G. C. Hyndman.

VENUS GALLINA, *Linn.*

Belfast Waterworks, Bryce; Bovevagh, County Derry, S. A. S.

VENUS OVATA, *Pennant.*

Belfast Waterworks, Bryce.

TAPES AUREUS, *Gmelin.*

Belfast Waterworks, Bryce.

TAPES DECUSSATUS, *Linn.*

Belfast Waterworks, Bryce.

TELLINA BALTHICA, *Linn.*

Belfast Waterworks, Bryce; Ballyrudder, Jeffreys and Hyndman; Falls Park, S. A. S.

TELLINA CALCAREA, *Chemnitz.*

Belfast Waterworks, G. C. Hyndman; Ballyrudder, Jeffreys and Hyndman.

MACTRA SUBSTRUNCTA, *Da Costa.*

Belfast Waterworks, G. C. Hyndman; Ballyrudder, Jeffreys and Hyndman, also S. A. S.

MACTRA SOLIDA *var.* TRUNCATA, *Montagu.*

Belfast Waterworks, Bryce.

MACTRA SOLIDA *var.* ELLIPTICA, *Brown.*

Belfast Waterworks, Bryce.

SCROBICULARIA PIPERATA, *Bellonius.*

Belfast Waterworks, Bryce.

MYA TRUNCATA, *Linn.*

Belfast Waterworks, S. A. S.

SAXICAVA RUGOSA, *Linn.*

Belfast Waterworks, Bryce.

SAXICAVA RUGOSA, *var.* ARCTICA, *Linn.*

Falls Park, Waterworks, Woodburn, Ballyrudder, S. A. S.

PHOLAS PARVA, *Pennant.*

Ballyrudder, County Antrim, where I found one specimen. It is mentioned by Jeffreys as occurring in the Red crag, which is the only other British deposit in which it is found fossil, so far as I know.

PHOLAS CRISPATA, *Linn.*

Belfast Waterworks, fragments only, Bryce.

CHITON MARMOREUS, *Fabricius.*

Ballyrudder, S. A. S.

EMARGINULA FISSURA, *Linn.*

Belfast Waterworks, Bryce.

TROCHUS TUMIDUS, *Montagu.*

Belfast Waterworks, Bryce.

LACUNA PALLIDULA, *Da Costa.*

Belfast Waterworks, Bryce.

LACUNA DIVARICATA, *Fabricious.*

Ballyrudder, S. A. S.

LITTORINA LITOREA, *Linn*

Belfast Waterworks, Bryce.

TURRITELLA TEREBRA, *Linn.*

Belfast Waterworks, Bryce ; Knock and Ballyrudder, S. A. S. ; Bovevagh, Co. Derry, Portlock. This is a rare shell in our Boulder Clay, except at Bovevagh, where I found it abundant in one spot, as recorded by General Portlock.

TURRITELLA EROSA, *Couthouy.*

Ballyrudder, Co. Antrim, Jeffreys and Hyndman.

NATICA MONTACUTI, *Forbes.*

Ballyrudder, Co. Antrim, Jeffreys and Hyndman.

NATICA AFFINIS, *Gmelin.*

Belfast Waterworks, Bryce ; Ballyrudder, S. A. S.

APORRHAIS PES-PELICANI, *Linn.*

Belfast Waterworks, Bryce.

TURPURA LAPILLUS, *Linn.*

Belfast Waterworks, Bryce.

BUCCINUM UNDATUM, *Linn.*

Belfast Waterworks, Bryce; Ballyrudder, S. A. S.

BUCCINUM UNDATUM *var.* FUSIFORME.

Belfast Waterworks, Bryce.

BUCCINUM GRŒANLANDICUM *var.* UNDULATUM, *Moller.*

Ballyrudder, County Antrim, Jeffreys and Hyndman.

MUREX ERINACEOUS, *Linn.*

Belfast Waterworks, Bryce.

TROPHON CLATHRATUS, *Linn.*

Belfast Waterworks, Bryce; Bangor, S. A. S.; Ballyrudder, Jeffreys and Hyndman, also S. A. S.

TROPHON CLATHRATUS *var.* GUNNERI, *Loven.*

Falls Park, Belfast, S. A. S.

TROPHON TRUNCATUS, *Stromer.*

Belfast Waterworks, Bryce; Falls Park, Ballyrudder, S. A. S.

TROPHON LATERICEUS, *Moller.*

Woodburn, Co. Antrim, S. A. S.

FUSUS ANTIQUUS, *Linn.*

Belfast Waterworks, Bryce.

FUSUS ANTIQUUS *Monst.* CINCTUM.

Belfast Waterworks, Geo. C. Hyndman, S. A. S. I have seen two specimens of this form, which seems to me entitled to be considered as a variety rather than as a monstrosity.

FUSUS GRACILIS, *Da Costa.*

Belfast Waterworks, Bryce.

NASSA RETICULATA, *Linn.*

Belfast Waterworks, Bryce.

NASSA PYGMÆA, *Lamarck.*

Bangor, Co. Down, S. A. S.

NASSA INCRASSATA. *Stromer.*

Ballyrudder, Co. Antrim, S. A. S.

PLEUROTOMA TURRICULA, *Montagu.*

Ballyrudder, Co. Antrim, Jeffreys and Hyndman.

PLEUROTOMA DECUSSATA, *Couthouy.*

Ballyrudder, Co. Antrim, S. A. S.

PLEUROTOMA EXARATA, *Moller.*

Ballyrudder, County Antrim, S. A. S.

PLEUROTOMA PYRAMIDALIS. *Stromer.*

Ballyrudder, Co. Antrim, Jeffreys and Hyndman. Dr. Jeffreys thinks that this was the shell published as *Magelia Pingelii* in Brit. Assoc. Report. It seems to me nearly certain that the correction is right.

CYPRÆA EUROPEA, *Montagu.*

Bangor, Co. Down, S. A. S.

APPENDIX VI.

A List

OF

RECENT FORAMINIFERA

OBTAINED DURING THE BELFAST NATURALISTS' FIELD CLUB'S EXCURSION TO

SOUTH DONEGAL,

August, 1880.

BY

JOSEPH WRIGHT, F.G.S.;

SPONGE REMAINS

FROM THE CARBONIFEROUS LIMESTONE OF BEN BULBEN, COUNTY SLIGO.

BY

JOSEPH WRIGHT, F.G.S.;

AND

FOSSIL SPONGE-SPICULES

FROM THE CARBONIFEROUS STRATA OF BEN BULBEN, NEAR SLIGO.

BY

H. J. CARTER, F.R.S., &c.,

Reprinted from "The Annals and Magazine of Natural History," for September, 1880.

Published by "THE BELFAST NATURALISTS' FIELD CLUB," April, 1882.

(*Proceedings Belfast Naturalists' Field Club.—Appendix* 1880-1881.)

FORAMINIFERA FOUND DURING THE BELFAST NATURALISTS' FIELD CLUB'S EXCURSION TO SOUTH DONEGAL, 1880.

Plate VIII. (upper half), figs. 1-5.

THE objects contemplated by the Club in visiting the Southern Coast of County Donegal embraced several departments of Natural Science, especially botany and geology, and as the time was limited it was impossible to devote much attention to dredging. Three shore gatherings, and four hauls of the dredge were, however, secured, and the present list is the result of an examination of material thus obtained. This list is not given as exhaustive of the locality visited, but simply as a contribution to our knowledge of the Irish rhizopodal fauna. It will also serve to indicate that rich results are likely to reward more systematic investigations in this quarter. Of the shore gatherings, that from Muckros was the only one which yielded a good supply of Microzoa. It was collected in a small sandy bay adjoining the singularly wild and remarkable precipices of Muckros Head. As is usual in the sandy bays open to the Atlantic, along our Western Coast *Truncatulina lobatula* greatly preponderated over all other forms. *Haplophragmium globigeriniforme*, *Lagena costata*, and *Polymorphina myristiformis* were large and abundant at Muckros, and also in the dredgings taken in the open sea, off the headlands of Slieve League, whilst the same forms were rare, and in poor condition in the more sheltered waters of Killybegs Harbour. The four dredgings from Killybegs and Slieve League might, with little disadvantage, have been recorded as from two stations. For example, the two gatherings from Killybegs, one taken in seven fathoms water, inside the harbour, the other in seventeen fathoms, a few hundred yards outside the Lighthouse, were very similar, both in nature of bottom and foraminiferous yield. The material dredged at both places was soft turfy ooze, yielding Microzoa in great profusion, and differing merely in that the one gathered outside the Light-

house was somewhat more sandy, and yielded a larger number of species. *Bulimina*, *Bolivina*, and *Cassidulina* were the characteristic genera at both places. The two gatherings taken off Slieve League differed scarcely in any particular.

I have taken advantage of the present opportunity to record (under column 8) a list of species found in a dredging taken off Portstewart, by my friend Mr. James Wright, and kindly sent by him to me for examination.

I am deeply indebted to my friend Mr. H. B. Brady, F.R.S., who, with his usual kindness, has examined and named the critical species; as also to my friend Mr. W. Swanston, F.G.S., for the accurate and artistic drawings of the Foraminifera which accompany this memoir.

I append a few remarks on one or two of the forms of more special interest.

HAPLOPHRAGMIUM GLOMERATUM, *Brady*. (Plate viii, figs, 1, 1*a*.)

Lituola glomerata, Brady, 1878, Ann. and Mag. Nat. Hist. Ser. 5, vol. 1, p. 433, Pl. xx. fig, 1 *a*, *b*, *c*.

This simple little *Haplophragmium* is abundant in Killybegs Harbour. It was also dredged last year by Mr. David Robertson, F.L.S., off the Isle of Skye, being the first record of its occurrence in British waters. The Irish examples are not so coarse in texture as the type specimens from the Arctic seas, figured by Mr. Brady.

AMMODISCUS SHONEANA, *Siddall*.

Trochammina Shoneana, Siddall, 1878, Proc. Chester. Soc. Nat. Sci., part 2, p. 46.

A few examples of this pretty little *Ammodiscus* were found off Killybegs Harbour. It has hitherto been only met with in the Estuary of the Dee, by Mr. J. D. Siddall; and in Belfast Lough, by Dr. Malcomson.

GAUDRYINA FILIFORMIS, *Berthelin*. (Pl. viii. figs, 3, 3*a*, 3*b*.)

Gaudryina filiformis, Berthelin, 1880, Mem. Soc. Geol. France, Ser. 3, Vol. 1. Mem. No. 5, p. 25, pl. 1, fig, 8, *a—d*.

An elongated sandy *Gaudryina*, with later chambers subquadrate. Often in a fragmentary state, the loose sandy texture of its test making it liable to be easily broken. Well-grown perfect examples are not unfrequent off Killybegs. It has been found at many stations round our Irish Coasts; also off Skye, by Mr. Robertson.

BULIMINA SUBTERES, *Brady, M.S.* (Pl. viii. figs, 2, 2*a*.)

Bulimina subteres, Brady, 1880, Notes on Reticularian Rhizopoda of the Challenger Expedition—Quart. Journ. Micr. Sci., Vol. xxi, New Series. p. 25.

Fine examples of this handsome *Bulimina* are not unfrequent off Killybegs Harbour. It has also been found off Skye, by Mr. Robertson, and off the Shetlands, by Mr. Brady.

LAGENA MARGINATA, *Walker & Jacob.* (Pl. viii. figs, 4, 4*a*.)

Serpula (Lagena) marginata, Walker & Jacob, 1784. Test. Min. p. 3, pl. 1, fig, 7.

Examples similar to Walker & Jacob's type, having a broad marginal keel of transparent shell substance, are not unfrequent round our coasts. Rare off Killybegs Harbour, seventeen fathoms.

LAGENA MARGINATA *var.* ORBIGNYANA, *Seguenza.* (Pl. viii. figs, 5, 5*a*.)

Fissurina Orbignyana, Seguenza, 1862, Foram, Monotal. Mess. p. 66, pl. 2, figs, 25, 26.

This well-marked variety, with three keels, is abundant almost everywhere round our coast. It is plentiful in all the Donegal gatherings.

LAGENA COSTATA, *Williamson.*

Entosolenia costata, 1858, Rec. For. Gr. Br. p. 9, pl. 1, fig, 18; Wright, Proc. Belfast Nat. Field Club—app. 1876-7, pl. 4, figs, 11—14.

I have remarked that, of all our British *Lagenæ*, this form appears to flourish best off the exposed parts of our coasts. I imagine this must be due to its strong test enabling it to thrive better in rough water than the other more delicately formed species. Frequent off Slieve League.

Fragments of a long, slender, tapering, arenaceous form, consisting of a number of segments, and having its shell-wall frequently composed of closely-fitting sponge spicula, arranged side by side, are not unfrequent off Slieve League, as well as at other stations round our coast. It is, most probably, a *Reophax*, but as no perfect example has as yet been obtained, its place among the Foraminifera could not be given with any degree of certainty.

LIST OF LOCALITIES, WITH PARTICULARS OF DEPTH, &c.

	LOCALITIES.	Bathymetrical Range.	Sea Bottom.	Relative quantities of material examined.	Number of species from each locality
1	DONEGAL; about half-a-mile from the town of Donegal, on the Southern side of the Bay; tide about half out when the gathering was taken.	Between tides.	Muddy sand	6¼ lbs	84
2	ARDARA; rock pools near the town; *Polystomella striato-punctata* abundant, with tests, very thin.	ditto.	A soft oozy mud, with offensive smell. ...	10 lbs	81
3	MUCKROS BAY; about six miles W. of Killybegs: *Truncatulina lobatula* in great profusion. ...	ditto.	Sand.	6½ lbs	69
4	Between Slieve League and Malinbeg; three-fourths mile off land	24 fms. ...	Sand.	11 lbs	62
5	Off Slieve League; one and a half miles off land.	34 fms. ...	Sand.	6 lbs	67
6	KILLYBEGS HARBOUR.	7 fms. ...	Soft, turfy ooze. ...	5 lbs	82
7	Off Killybegs Harbour; a few hundred yards outside the Lighthouse.	17 fms. ...	Turfy ooze, and sand ...	12½ lbs	101
8	Off Portstewart; one mile off land.	15 fms. ...	Sand.	——	76

TABLE SHOWING THE DISTRIBUTION OF FORAMINIFERA GATHERED DURING THE BELFAST NATURALISTS' FIELD CLUB'S EXCURSION TO SOUTH DONEGAL, 1880.

ABBREVIATIONS:—v r, very rare; r, rare; c, common; v c, very common. Species marked * are new to the British Fauna. Figures in column marked † refer to plate VIII accompanying this paper.

LIST OF SPECIES.	Reference to plate VIII.	Donegal,—between tides.	Ardara,—between tides.	Muckros Bay,—between tides.	Between Slieve League and Malinbeg,—24 fms.	Off Slieve League,—34 fms.	Killybegs Harbour,—7 fms.	Off Killybegs Harbour,—17 fms.	Off Portatewart,—15 fms.
	†	1	2	3	4	5	6	7	8
CORNUSPIRA, *Schultze.*									
involvens, *Reuss*	...	...	...	r	r	r	r	r	r
foliacea, *Philippi*	...	...	...	...	...	...	...	v r	...
BILOCULINA, *D'Orb.*									
ringens, *Lamk.*	...	...	...	c	r	r	v c	c	r
depressa, *D'Orb.*	...	...	...	c	r	r	r	r	c
elongata, *D'Orb.*	...	v r	...	...	r	...	r	r	...
sphæra, *D'Orb.*	...	...	..	c	...	...	...	...	r
MILIOLINA, *Will.*									
trigonula, *Lamk.*	...	...	...	...	...	r	r	r	r
tricarinata, *D'Orb.*	...	...	...	r	...	r	r	r	r
oblonga, *Montagu*	...	...	...	r	...	r	r	r	r
Brongniartii, *D'Orb.*	...	...	...	r	...	...	r	r	r
seminulum, *Linn.*	...	r	...	c	c	c	v c	v c	c
subrotunda, *Montagu*	...	...	r	c	c	c	c	c	v c
secans, *D'Orb.*	...	...	v r	c	r	...	...	v r	c
bicornis, *W. & J.*	...	...	v r	c	v c	c	r	r	c
Ferussacii, *D'Orb.*	...	...	...	r	r	...	v r	r	r
fusca, *Brady*	...	r	c	...	...	...	...	...	...
SPIROLOCULINA, *D'Orb.*	...								
limbata, *D'Orb.*	...	...	...	r	r	r	r	r	r
planulata, *Lamk.*	...	...	...	...	r	r	r	r	v r
PSAMMATODENDRON, *Norman, M.S.*									
arborescens, *Norman, M.S.*, fragment	...	...	...	...	...	...	...	...	v r

TABLE—Continued.

LIST OF LOCALITIES.	Reference to plate VIII.	Donegal,—between tides.	Ardara,—between tides.	Muckros Bay,—between tides.	Between Slieve League and Malinbeg,—24 fms.	Off Slieve League,—34 fms.	Killybegs Harbour,—7 fms.	Off Killybegs Harbour,—17 fms.	Off Portstewart,—15 fms.
	†	1	2	3	4	5	6	7	8
REOPHAX, *Montfort.*									
fusiformis, *Will.*	...	..	...	...	...	...	...	v r	...
scorpiurus, *Montfort*	...	...	...	...	..	...	r	r	...
HAPLOPHRAGMIUM, *Reuss.*									
globigeriniforme, *P. & J.* ..	..	...	...	c	v c	c	r	r	v c
glomeratum, *Brady*	Fig1	...	...	...	v r	v r	r	v c	...
pseudospirale, *Will.*	...	...	...	...	..	...	r	r	...
Canariense, *D'Orb.*	...	...	v r	c	c	c	r	r	c
AMMODISCUS, *Reuss.*									
incerta, *D'Orb.*	...	...	...	...	...	...	r	r	...
gordialis, *J. & P.*	...	...	...	r	...	r	r	r	v r
Shoneana, *Siddall*	...	...	...	...	...	..	...	r	..
TROCHAMMINA, *P. & J.*									
squamata, *P. & J.*	...	...	...	v r	...	r	r	r	r
inflata, *Montagu*	...	r	v r	...	...	...	...	...	...
TEXTULARIA, *Defrance.*									
sagittula, *Defrance*	...	...	r	c	c	c	c	c	c
agglutinans, *D'Orb.*	...	...	...	...	r	...	...	...	...
trochus, *D'Orb.*	...	...	...	...	...	...	...	v r	...
difformis, *Will.*	...	r	..	c	r	r	r	r	r
GAUDRYINA, *D'Orb.*	...								
*filiformis, *Berthelin.*	Fig3	...	..	v r	...	v r	v c	v c	v r
VERNEUILINA, *D'Orb.*									
polystropha, *Reuss*	..	v r	.	...	v r	r	v c	r	...
BULIMINA, *D'Orb.*									
pupoides, *D'Orb.*	...	c	r	c	c	c	v c	v c	c
marginata, *D'Orb.*	...	v r	v r	r	...	v r	c	v c	r
aculeata, *D'Orb.*	...	...	...	...	..	...	c	v c	...
ovata, *D'Orb.*	...	c	r	c	r	r	v c	v c	r
elegantissima, *D'Orb.* ...	...	v r	..	r	v r	...	c	c	..
*subteres, *Brady*	Fig2	...	...	v r	...	..	r	r	v r
VIRGULINA, *D'Orb.*									
Schreibersii, *Czjzek*	...	v r	...	...	...	...	c	v c	...
BOLIVINA, *D'Orb.*									
dilatata, *Reuss*	...	v r	r	r	r	r	c	v c	...
punctata, *D'Orb.*	...	v r	...	r	...	v r	c	v c	v r
plicata, *D'Orb.*	...	r	r	c	r	r	c	v c	r

TABLE—Continued.

LIST OF LOCALITIES.	Reference to plate VIII.	Donegal,—between tides.	Ardara,—between tides.	Muckros Bay,—between tides.	Between Slieve League and Malinbeg,—24 fms.	Off Slieve League,—34 fms.	Killybegs Harbour,—7 fms.	Off Killybegs Harbour,—17 fms.	Off Portstewart,—15 fms.
	†	1	2	3	4	5	6	7	8
CASSIDULINA, *D'Orb.*									
lævigata, *D'Orb.*	...	v r	...	c	r	r	c	c	r
crassa, *D'Orb.*	...	v r	v r	c	r	r	c	c	r
oblonga, *D'Orb.*	...	...	...	...	...	...	r	r	...
Bradyi, *Norman M.S.*, broken.	...	...	...	...	...	...	...	...	v r
LAGENA, *Walker and Jacob.*									
sulcata, *W. & J.*	...	r	r	c	...	r	r	c	c
costata, *Will.*	...	..	r	c	v c	c	v r	r	c
Williamsoni, *Alcock*	...	c	c	c	c	c	c	c	v c
Lyellii, *Seguenza*	...	...	...	...	...	...	...	r	...
lævis, *Montagu*	...	c	c	c	r	c	c	c	c
gracillima, *Seguenza*	...	...	...	...	...	c	c	c	...
globosa, *Montagu*	...	...	v r	r	r	r	v r	r	r
striata, *D'Orb.*	...	v r	..	...	r	r	c	v c	...
striato-punctata, *P. & J.* ..	...	...	...	...	...	...	...	r	...
gracilis, *Will.*	...	...	...	...	...	c	r	c	...
semistriata, *Will.*	...	r	...	c	r	c	c	c	r
hispida, *Reuss*	..	...	...	...	...	...	...	r	...
aspera, *Reuss*	...	...	...	...	...	...	...	r	...
caudata, *D'Orb.*	...	r	...	r	...	r	r	r	r
marginata, *W. & J.*	Fig4	...	...	...	...	...	r	r	r
var. Orbignyana, *Seguenza*...	Fig5	c	c	c	c	c	c	c	c
var. trigono-marginata, *P. & J.*	...	...	...	...	v r	...	...	v r	r
lucida, *Will.*	...	c	c	c	r	c	c	c	c
var. (trigono-) oblonga, *Seguenza*	...	...	...	...	...	...	...	r	...
pulchella, *Brady*	...	...	..	v r	...	v r	...	v r	..
ornata, *Will.*	...	...	...	...	...	...	r	r	...
lagenoides, *Will.*	...	...	...	...	...	...	...	r	...
squamosa, *Montagu*	...	c	c	c	c	c	c	c	c
hexagona, *Will.*	...	r	c	r	r	r	c	r	c
LINGULINA, *D'Orb.*									
carinata, *D'Orb.*, small ...	...	...	...	...	...	...	...	v r	...
*tenera, Bornemann (fossil ?)...	...		...		...	...	...	...	v r

TABLE—Continued.

LIST OF LOCALITIES.	Reference to plate VIII.	Donegal,—between tides.	Ardara,—between tides.	Muckros Bay,—between tides.	Between Slieve League and Malinbeg,—24 fms.	Off Slieve League,—34 fms.	Killybegs Harbour,—7 fms.	Off Killybegs Harbour,—17 fms.	Off Portstewart,—15 fms.
	†	1	2	3	4	5	6	7	8
NODOSARIA, *Lamk.*									
scalaris, *Batsch.*	...	...	...	v r	...	...	c	c	v r
pyrula, *D'Orb.*, and dentaline variety	...	...	...	...	...	...	r	r	r
VAGINULINA, *D'Orb.*									
legumen, *Linn.*, small ...	...	...	...	...	...	v r	r	r	...
MARGINULINA, *D'Orb.*									
lituus, *D'Orb.*, small	...	...	...	...	...	...	...	r	...
CRISTELLARIA, *Lamk.*									
rotulata, *Lamk.*	...	...	...	r	...	...	r	r	v r
crepidula, *F. & M.*	...	...	...	r	r	r	v r	r	v r
POLYMORPHINA, *D'Orb.*									
lactea, *W. & J.*	...	r	...	r	...	r	...	...	r
gibba, *D'Orb.*	...	r	...	c	c	c	r	r	c
oblonga, *Will.*	...	...	...	r	r	...	r	r	r
compressa, *D'Orb.*	...	...	...	c	r	c	r	c	r
concava, *Will.*	...	...	...	...	...	...	...	v r	...
myristiformis, *Will.*, large ..	...	...	...	c	c	c	...	r	...
communis, *D'Orb.*	...	...	...	...	...	v r	...	...	...
UVIGERINA, *D'Orb.*									
angulosa, *Will.*	...	v r	r	c	r	r	c	r	r
ORBULINA, *D'Orb.*									
universa, *D'Orb.*	...	...	v r	...	r	v r	...	...	...
GLOBIGERINA, *D'Orb.*									
bulloides, *D'Orb.*	...	c	v c	c	r	c	r	r	v c
inflata, *D'Orb.*	...	...	...	v r	...	r	...	v r	r
SPIRILLINA, *Ehrenb.*									
vivipara, *Ehrenb.*	...	...	...	v r	...	r	...	r	v r
PATELLINA, *Will.*									
corrugata, *Will.*	...	...	...	v r	r	v r	...	c	c	v r
DISCORBINA, *P. & J.*									
rosacea, *D'Orb.*	...	...	...	c	r	r	c	r	c
Parisiensis, *D'Orb.*	...	...	...	...	...	...	...	v r	v r
*Wrightii, *Brady*	...	...	...	c	r	...	...	...	v r
Globularis, *D'Orb.*	...	...	...	v c	v c	v c	c	c	c
Bertheloti, *D'Orb.*	...	...	...	v r	...	...	r	r	v r

TABLE—Continued.

LIST OF LOCALITIES.	Reference to plate VIII.	Donegal,—between tides.	Ardara,—between tides.	Muckros Bay,—between tides.	Between Slieve League and Malinbeg.—24 fms.	Off Slieve League,—34 fms.	Killybegs Harbour,—7 fms.	Off Killybegs Harbour,—17 fms.	Off Portstewart,—15 fms.
	†	1	2	3	4	5	6	7	8
PLANORBULINA, *D'Orb.*									
Mediterranensis, *D'Orb.* ...	...	...	...	c	c	r	c	c	c
TRUNCATULINA, *D'Orb.*									
lobatula, *Walker*	...	v c	v c	v c	v c	v c	v c	v c	v c
refulgens, *Montfort*	...	...	...	...	c	v r	...	..	...
TINOPORUS, *Montfort*									
lævis, *P. & J.*	...	...	...	...	r	v r	..	...	...
lucidus, *Brady*	...	...	v r	c	c	r	r	...	r
PULVINULINA, *P. & J.*									
repanda, *F. & M.*, small ...	...	...	...	...	r	...	...	...	r
auricula, *F. & M.*	...	...	...	r	c	r	...	...	r
Karsteni, *Reuss*, small ...	...	...	...	...	...	...	r	v r	...
ROTALIA, *Lamk.*									
Beccarii, *Linn.*	...	c	..	v r	r	...	c	v c	c
nitida, *Will.*	...	...	v r	c	r	r	c	c	c
OPERCULINA, *D'Orb.*									
ammonoides, *Gron.*, large ...	...	...	...	...	v r	..	r	r	...
POLYSTOMELLA, *Lamk.*									
crispa, *Linn.*	...	..	...	c	r	r	c	r	r
striato-punctata, *F. & M.* ...	...	v c	v c	c	r	c	v c	v c	c
NONIONINA, *D'Orb.*									
turgida, *Will.*	...	..	...	r	r	r	v c	v c	r
depressula, *W. & J.*	...	v c	v c	c	r	r	r	r	c
scapha, *F. & M.*, small ...	...	...	...	...	...	...	...	...	v r
umbilicatula, *Montagu* ...	...	...	...	...	...	...	r	c	...
stelligera, *D'Orb.*	...	v r	...	...	...	...	v r	r	r

(*Proceedings Belfast Naturalists' Field Club.—Appendix*, 1880-1881.)

SPONGE REMAINS FROM THE CARBONIFEROUS LIMESTONE OF BEN BULBEN, CO. SLIGO.

BY JOSEPH WRIGHT, F.G.S.

(Read before the Belfast Naturalists' Field Club, on the 13th April, 1881.)

AFTER referring briefly to the several groups of sponges, and their position in the animal kingdom, Mr. Wright proceeded to say, that having examined a portion of a pale yellow clay, which had been procured near the summit of Ben Bulben Mountain by Mr. S. A Stewart, he found that it contained an abundance of sponge-spicules, this being the only instance of such remains having been found in Ireland in rocks of Carboniferous age. In company of Mr. Stewart he had visited the spot for the purpose of ascertaining the mode of occurrence of the sponge remains, and to procure a sufficient quantity of the material for his investigations. Ben Bulben is a grand mountain, 1,722 feet high, whose stupendous cliffs arrest the attention of the traveller on the way from Bundoran to Sligo. The rock here may truly be called mountain limestone, the entire range, of which Ben Bulben is the most conspicuous, being composed of Carboniferous Limestone from the base to the summit. Nowhere else in Ireland do the Carboniferous rocks attain so great an elevation. Two days were spent on Ben Bulben, an ample supply of the fossiliferous clay obtained, and also many rare fossils met with in the limestone. Crinoids were especially abundant, notably the pretty little *Pentremites Derbiensis*. The curiously branched coral, *Cladochonus baccilaris*, was seen at one spot in great masses in the stone. The clay in question has been under examination, and already has yielded eleven different forms of sponge-spicules. Of these, four belong to the calcareous sponges, two to the Lithistidæ, and the remaining five to the group of the Hexactinellidæ. Three of these last-mentioned are extremely beautiful forms, being spirally ringed spicules apparently referrible to one species of sponge, and new to science. Mr. Wright further mentioned that some of the clay had been submitted to his friend, Mr. James Cooke, of Cork, for chemical analysis, and was found to be

almost purely silicious. Mr. Cooke regards it as disintegrated chert, the disintegrating agent being animal life. The following is Mr. Cooke's analysis:—Silica, soluble and insoluble, 97 to 98 per cent.; alumina, with sesquioxide of iron, 1 per cent.; lime, less than 1 per cent.; traces of magnesia and manganese, 1-10 per cent. Mr. Cooke finds clear proof of organic matter still existing in the clay, and he considers that the silica was probably supplied by some volcanic outburst. In the "rotten limestone" of Cunningham Baidland, Ayrshire, which seems to resemble our Ben Bulben clay, sponge-spicules are abundant, and very similar to those found in Sligo. In the Irish, as in the Scotch beds, chert occurs associated with the clays in which the spicules are found. This is similar to what occurs in our Cretaceous rocks, and points to the fact of the silica which forms our flints and chert having been, in part at least, derived from silicious sponges which abounded in ancient seas, the silica being redeposited in layers, or concentrated round some sponge or other organism, and so forming our nodular flints. The paper was illustrated by a fine series of diagrams representing the various forms of spicules obtained in the Sligo mountains, as well as the material in which they were found. Several examples of recent and fossil sponges were also exhibited at the close of the meeting.

Through the kind permission of Mr. H. J. Carter, F.R.S., the following paper, "On fossil sponge-spicules from the Carboniferous strata of Ben Bulben," has been reprinted from the Annals and Magazine of Natural History, Sept., 1880; the figures which accompanied it have been reproduced by photo-lithography, and are an exact reproduction of the originals.

(From the Annals and Magazine of Natural History *for Sept.*, 1880.*)*

ON FOSSIL SPONGE-SPICULES FROM THE CARBONIFEROUS STRATA OF BEN BULBEN, NEAR SLIGO.

BY H. J. CARTER, F.R.S., &c.

Plate VIII., (lower half) figs. 1-17.

IN the last contribution that Mr. James Thomson made to our knowledge of fossil sponges which existed during the Carboniferous epoch in the neighbourhood of Glasgow ('Annals,' 1879, vol. iii., p. 141, pl. xxi.), I described and illustrated *Holasterella conferta*, a genus of sponges, as the name indicates, exclusively composed of stelliform spicules, whose typical figure, from the same locality, had been found and illustrated a year previously. At the same time I added (*ibid.* p. 145) some observations on specimens of

limestone belonging to the Carboniferous series which Mr. Thomson had gathered from the western side of Black Head, county Clare, at the southern extremity of the entrance to Galway Bay, in which the siliceous element (often present in great quantity) seemed to indicate that it had been derived from some organisms more or less composed of silica, especially as in other parts, where the limestone is pure, the remains of sponge-spicules in a calcified state are abundantly recognizable, although in none of the specimens sent to me could I find a *definite* form.

Here the matter rested, so far as I myself was concerned; but Mr. Joseph Wright, F.G.S., who resides at Belfast, having subsequently visited the mountain near Sligo called "Ben Bulben," actually ascertained the presence of several forms of sponge-spicules in the limestone of the Carboniferous system there, and kindly forwarded specimens of them to me, together with fragments of the strata in which they are found, for description and illustration. But before I proceed to this, it is desirable that the following extracts from Mr. Wright's letter, dated Jan. 1, 1880, which accompanied them, should be given, viz.:—

"Last summer my friend Mr. S. A. Stewart spent a few days botanizing on Ben Bulben, and, whilst there, observed soft clay bands in the limestone, of which he brought me three different 'gatherings' to examine for Foraminifera, viz.:—1, containing no organisms; 2, a few Foraminifera and spicules; and 3, rich in sponge-spicules.

"The last material proved so interesting that we afterwards visited the place in company and brought away a quantity of the clay. It is of a pale yellowish colour, and occurs interstratified with bands of chert, especially at the summit of the mountain, where it is very soft, owing, apparently, to exposure to the weather; on the other hand, lower down, the same yellow material occurs, but much harder, although lighter, from its open pumice-like structure. At both places we found a great number of fossils belonging to the limestone of the Carboniferous system, viz. . . . . .

"I sent some of the clay to a friend in Cork for analysis; and he has informed me that it contains 98 per cent. of silica."

After this follow sketches of all the forms of fossil sponge-spicules that Mr. Wright by dexterous manipulation was enabled to extricate from the clay—to which, after carefully looking over all that he found, which were subsequently forwarded to me, I can add no more specifically, although I have been able to find a few with slightly different forms, which have assisted me in the following descriptions. Of course, as drift-spicules, which these must have been when originally deposited, to say nothing of the subsequent effects of fossilization, &c., they are nearly all fragmentary; but sufficient of them remains for easy recognition and for restoration, as will be seen by the illustrations.

First and foremost is a sexradiate stellate (Pl. XIV. B. fig. 2), which in

number of rays varies from 6, 12, 18 to 24 (figs. 4-7), according to the amount of division of the extremities of six arms. The stellates vary in size from 1-75th to 5-24ths of an inch (fig. 1) in diameter; and the smallest are not only the most numerous and have the greatest number of rays, but, as the latter often arise from a division of the arm close to the centre, they acquire the appearance of globular little stars; while, where the arms are a little more extended, they often present the appearance of a "Maltese cross." But the most striking feature of this spicule is that, from the smallest to the largest, each ray is spiriform; that is, its surface presents a spiral inflation in which the coils are more or less numerous, extending from the base to the apex of the ray (figs. 2 and 3); where they are most numerous they, of course, are more transverse, and then appear like separate annulations; while the most remarkable difference in them is confined to the rays of the largest stellates, where, towards the base, the spiral line of inflation becomes broken up into short portions (fig. 3 *b*), which look very much, from their alternate arrangement in adjoining coils, as if this had been produced by another spiral groove pursuing an opposite direction (that is, across the original inflation).

This fossil spicule is incomparably more numerous than the other spicular forms accompanying it; so that, together with its peculiarities *being confined to a stellate form*, I am compelled to think that it must have belonged to a species of *Holasterella* which, if found *in situ* hereafter (that is, forming the entire sponge), will be like *H. conferta*; hence I have much pleasure in naming it *Holasterella Wrightii*, after its discoverer.

The next spicule in frequency appears to have been a hexactinellid, with the sixth or external arm not produced as in the large surface-spicules of the Sarcohexactinellida, in which four arms are extended over the surface laterally, while the fifth, like the shaft of a nail, goes vertically inwards (fig. 8). With this, and also equally plentiful, are the free ends of "anchoring-spicules" terminated by four much-recurved spines or flukes situated opposite each other, and still attached to a small fragment of the shaft (fig. 9), longer and larger portions of which may be observed in the "chert," both longitudinally and in transverse sections under fracture, indicating that with the anchoring ends they are the fragmentary remains of what originally were anchoring- or cord-spicules of a *Hyalonema* or Sarcohexactinellid sponge.

Tolerably numerous also are Lithistid spicules, especially one like a tripod, in which the centre is convex and smooth, while the three legs, bending outwards and downwards, end respectively in expanded concave feet, which seem to show that they were once applied to similar surfaces on adjoining spicules (figs. 10 and 11). This in all probability was a surface-spicule like those of *Corallistes aculeata* ('Annals,' 1880, vol. vi. pl. vii. fig. 45). Fragments of other Lithistid spicules are also present, such as the dendritically branched surface-spicule (fig. 12), and the shafted one of the fully developed or internal structure (fig. 13).

To these may be added a sausage-shaped spicule like that of some of the *Reniera* of the present day, also tolerably plentiful (fig. 14); and other fusiform acerate ones (figs. 15 and 16), which being common to many kinds of sponges, cannot in their isolated state, be identified with any in particular.

Two fragments represent the arms of a quadriradiate spicule (fig. 17); but whether these were equal in length, or one was prolonged into a shaft, there is no evidence to show: if the former, it probably belonged to one of the Pachastrellina; if the latter, to a zone-spicule of one of the Pachytragida.

The most interesting part of this discovery, however, is that the "clay" of Ben Bulben, in which Mr. Wright found these remains, is apparently identical in every respect with that sent me by Mr. James Thomson, in which he found *Holasterella conferta*, near Glasgow. In both instances isolated sponge-spicules of different kinds are disseminated through it, which can be obtained by edulcoration with water, and are composed of silica in an opaque or chalcedonic state, rendered more or less irregular by the presence of rhomboidal excavations on the surface.

Here I might observe that, not only are the sponge-spicules, and the minute fossils of the Carboniferous Limestone which accompany them, silicified and pitted on the surface with the same kind of rhomboidal excavations, but the "chert" to which Mr. Wright has alluded appears to be a solid pseudomorph of the limestone; for its pumice-like worm-eaten character occurring here and there, from partial absorption or decomposition of the material, presents a skeletal rhomboidal structure; while the same kind of rhomboidal excavations characterize the surface of the weather-worn *calcareous* fossils in the *pure Devonian Limestone* of this neighbourhood; by which I am led to infer that, in the first place, the sponge-spicules become partially or wholly calcified among *calcareous* material, else why should they now present rhomboidal excavations on their surface? that subsequently the siliceous element, being liberated, replaced the calcareous material so as to form the "chert;" and, thirdly, that the rhomboidal excavations on the surface of the spicules and the partial absorption of the spicules themselves, leaving nothing but their moulds, arises from the changes which the siliceous element itself is now undergoing—that is, becoming decomposed and removed, or passing from an amorphous state into clear quartz prisms. The latter, although but slightly the case, comparatively, in the specimens from Ben Bulben, is characteristically so in the specimens to which I have alluded from Black Head, Co. Clare, wherein not only geodic cavities lined with quartz prisms, but perfect prisms themselves are present, imbedded in the amorphous siliceous material composing the rock, while all satisfactory traces of sponge-spicule form in these parts is entirely absent, so far as the specimens sent to me indicated.

Lastly, I am inclined to think that the "clay" of Ben Bulben is the "chert" decomposed, and that the innumerable fragments of sponge-spicules which are present in the latter (for in some parts the chert appears to be almost entirely

composed of them), rendered still more fragmentary by partial removal so as to leave nothing but their moulds, as before stated, are those which at last come out entire, so far as they go, in the washing of the "clay."

It is remarkable, too, that by far the most plentiful among Mr. Thomson's collection of spicules from the clay near Glasgow is that of *Holasterella conferta*, as it is that of *H. Wrightii* at Ben Bulben; the "sausage-shaped" spicule (fig. 14) is also analogous to that of the supposed Renierid sponge ('Annals,' 1879, vol. iii. pl. xxi. fig. 11), and about the same in frequency. In Mr. Thomson's collection were also fragments of Lithistid spicules; and last summer he sent me a section of an entire sponge in Carboniferous Limestone, all calcified, with weathered-out spicules on the surface, but none of it sufficiently defined for useful delineation. The collection also contained some zone-spicules of the Pachytragida; so that, altogether, the Spongida appear to have been as plentiful and as varied in the Carboniferous age as at any other time.

It would be worth while, when the opportunity offers, for some one to look over the weathered surface of the strata in the mountain of Ben Bulben, where fragments, if not entire specimens, of sponges from which the spicules come might be found, after the manner that they have been discovered in the Carboniferous system in the south-west of Scotland.

EXPLANATION OF PLATE VIII. (Upper Half.)

FIG. 1. *Haplophragmium glomeratum*, Brady, magnified 60 diam. Off Killybegs Harbour, 17 fms.

FIG. 2. *Bulimina subteres*, Brady, magnified 60 diam. Off Killybegs Harbour, 17 fms.

FIG. 3. *Gaudryina filiformis*, Berthelin, magnified 60 diam. Off Killybegs Harbour, 17 fms.

FIG. 4. *Lagena marginata*, W. & J., magnified 60 diam. Off Killybegs Harbour, 17 fms.

FIG. 5. *Lagena marginata*, var. *Orbignyana*, Seguenza, magnified 60 diam. Off Killybegs Harbour, 17 fms.

EXPLANATION OF PLATE VIII. (Lower Half.)

FIG. 1. *Holasterella Wrightii*, spicule of, nat. size. The largest met with (diagram).

FIG. 2. The same, restored, to show the perfect form with spiral inflation on the arms. Magnified 7 diameters.

FIG. 3. The same. Furcate arm, much more magnified, to show—*a*, the simple spiral inflation, and *b*, the same when "broken up." Scale 1-48th to 1-1800th inch.

FIGS. 4, 5, 6, and 7. The same, to show the simple sexradiate and multifid divisions of the arms respectively (diagrams).

FIG. 8. Sarcohexactinellid. Fragment of large surface-spicule of unknown species.

FIG. 9. The same. Free end of anchoring-spicule.

FIG. 10. Lithistid. ? Tripod-like surface-spicule of unknown species.

FIG. 11. The same. Lateral view.

FIG. 12. The same. Dendritically branched surface-spicule of unknown species.

FIG. 13. The same. Form of body-spicule of unknown species.

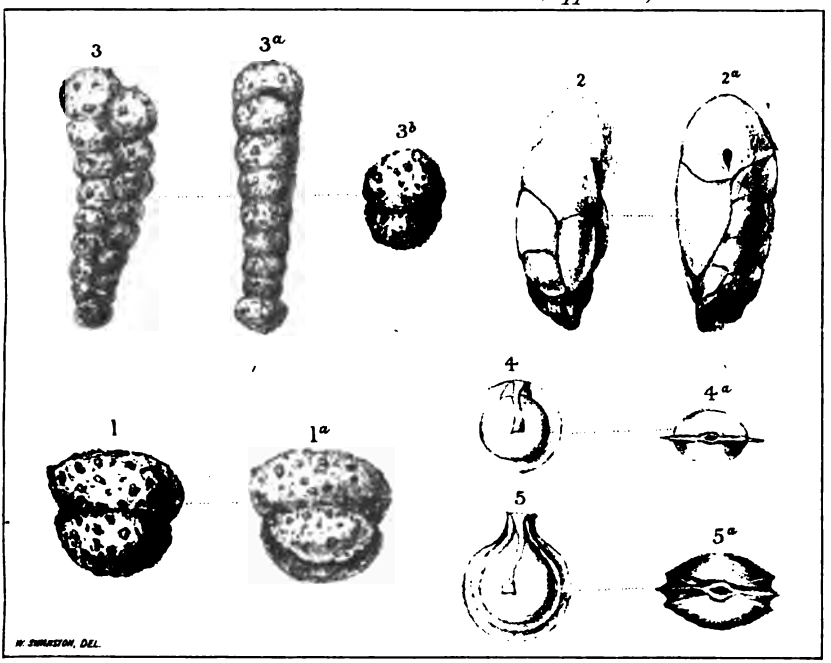
FIG. 14. *Reniera* ?. Sausage-shaped spicule of unknown species.

FIG. 15. Acerate spicule of unknown sponge.

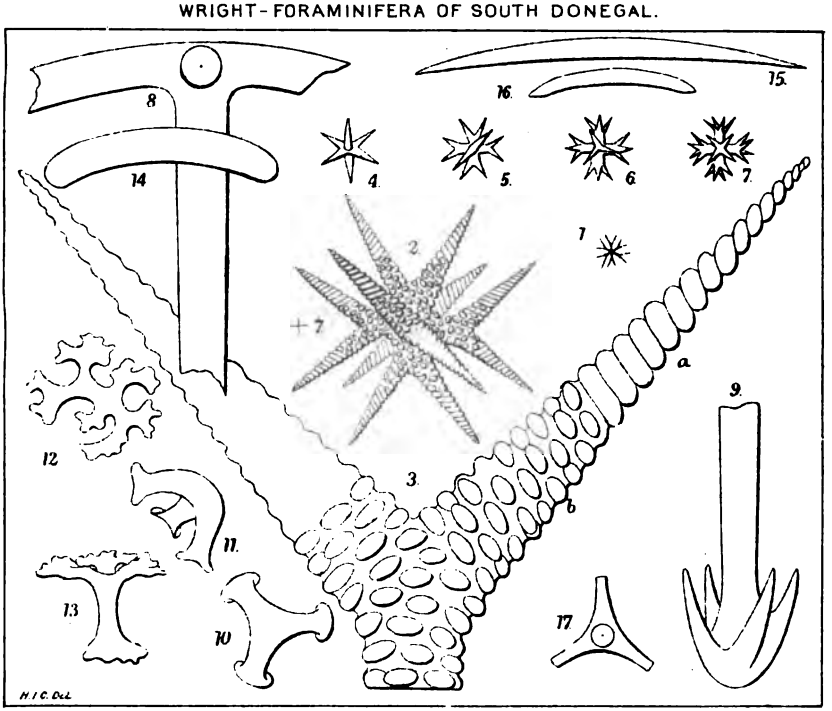
FIG. 16. The same.

FIG. 17. Quadriradiate fragment of spicule of unknown sponge.

N.B.—Figs. 3 and 8-17 inclusively are all drawn to the scale of 1-48th to 1-1800th inch.



WRIGHT - FORAMINIFERA OF SOUTH DONEGAL.



CARTER - CARBONIFEROUS SPONGE SPICULES OF BEN BULBEN.

APPENDIX VII.

SUPPLEMENT

TO A

LIST OF MOSSES

OF THE

NORTH-EAST OF IRELAND.

BY

SAMUEL ALEX. STEWART,

Fellow of the Botanical Society of Edinburgh.

PUBLISHED BY

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SUPPLEMENT

TO A LIST OF THE MOSSES OF THE NORTH-EAST OF IRELAND.

BY SAMUEL ALEX. STEWART,

Fellow of the Botanical Society of Edinburgh.

NINE years have passed away since the list, to which this is a supplement, was published in the Proceedings of the Belfast Naturalists' Field Club. During that period the world has not failed to move on, nor has botanical knowledge stood still. Stimulated mainly by the Royal Irish Academy, a number of Irish naturalists have been scrutinising narrowly the flora of their country. The results of these investigations have been embodied in valuable reports published, or now being published, in the Proceedings of the Academy. These papers, however, have related entirely to the *phanerogamic* plants, with the exception of that by Dr. D. Moore, on Irish Hepaticæ. Meanwhile, with the rolling on of events, we have to deplore the loss of some who stood in the front rank of the small band of Irish Botanists. Dr. David Moore and Isaac Carroll have been removed by death, and the inexorable fate which so recently overtook our fellow-member, Mr. T. H. Corry, has deprived our Society of one who felt the deepest interest in the objects for which it was established. The wider field of Irish Botany, too, is affected by the premature loss of one who was doing much to enlarge our knowledge of the native flowering plants, and who hoped to take part in the investigation of our *Cryptogamic* flora also.

But while the wheels of fate roll on, bearing away, as we have seen, some of our "best and bravest," they are bringing up to our ranks valuable accessions, and new life. Ever since systematic botany assumed the rank of a science, it has not lacked votaries in Ireland, gifted with acuteness of obser-

vation and enthusiastic love for the study. In the annals of Irish Botany, we find Wade, Templeton, Turner, and others ably leading the van at the close of last century. These were succeeded by such well-known naturalists as Mackay, Taylor, and Hutchins, and these, again, by others who have survived to our own times. So much for the past: indications are not wanting that, in the coming time, there will be those who will carry our knowledge to a still higher point.

As stated in the preface to the list of 1875, the district to which it referred embraced the counties of Down and Antrim, with a small part of Derry. It is a matter of regret that, even yet, it is not possible to include the whole of Derry. The fact is, that as far as bryology is concerned, the greater portion of that county is up to the present a *terra incognita*. The Mourne Mountains, and the southern portion of County Down, have yielded some novelties to the as yet incomplete, examination of the Rev. H. W. Lett, of Ardmore, and Rev. C. Herbert Waddell, of Warrenpoint. These gentlemen have kindly furnished the names of the most interesting species collected by them. A number of their plants remain, which have not yet been diagnosed, but it will be seen, on reference to the list which follows, that they have added materially to our Moss-flora, in a very brief period. It is to be hoped that the quickness of observation, and scientific method Mr. Lett and Mr. Waddell have already manifested will be employed to still further elucidate the natural history of a very interesting region. The Museum of the Belfast Natural History and Philosophical Society contains a collection of mosses by Mr. T. Drummond, acquired by the Society in 1831. Some of these plants have been collected in our locality, and a few of them, not previously published, are now put on record.

The number of Mosses included in the list of 1875 amounted to 238, and the 35 now added bring the number up to 273. Such of the plants as seemed at all doubtful have been submitted to G. A. Holt, Esq., of Manchester, who kindly consented to revise them.* Such revision is of the utmost importance; and the fact that a bryologist of such accuracy has seen the specimens adds much to the value of the records. Rev. John Fergusson, of Forfarshire, has also kindly assisted with advice on some critical plants. Several rare plants have been contribued by J. H. Davies, Esq., of Glenmore; one of these being *Orthotrichum Sprucei*, a species not included in any previous list of Irish Mosses.

Objections will, no doubt, be made to the arrangement here followed, and perhaps also to the nomenclature. It has, however, seemed desirable not to depart from the classification of the original list, to which this is supplementary. As respects the nomenclature I am not convinced of the value of small genera, based on trivial characters.

* Rev. Mr Lett's specimens have been confirmed by Mr. West, of Bradford.

LIST OF SPECIES.

The asterisk denotes that the species was not previously recorded for the district.

ORTHOTRICHUM HETEROMALLA. *Dill.*

This species is frequent throughout the district, but never abundant.

HOOKERIA LUCENS. *Dill.*

Tollymore Park, and Rostrevor Mountain, County Down.—Rev. C. H. Waddell.

HYPNUM LOREUM. *Dill.*

Frequent in the Mourne Mountains.—Rev. C. H. Waddell. Rostrevor Wood; Slieve Comedagh; Slieve Croob (Down); fruit abundant; Ballygally Head (Antrim).—S. A. S.

H. BREVIROSTRE. *Ehr.*

Narrowwater Wood, near Newry, fruiting abundantly.—Rev. C. H. Waddell. Fruiting sparingly at upper end of Holywood Glen, in January, 1876.—S. A. S.

H. SCORPIOIDES. *Dill.*

Rathlin Island (Antrim); barren.—S.A.S.

* H. SARMENTOSUM. *Wahl.*

Very rare. Spinkwee River Glen, above Tollymore Park.—Rev. H. W. Lett.

H. RUGYRIUM. *Schp.*

[This moss, so rare in Ireland, was found by Rev. Mr. Waddell on Anglesey Mountain, County Louth. It should be sought for on the Mourne Mountains also.]

H. RESUPINATUM. *Wils.*

Ballyholme; Cregagh Glen (Down); Kilroot; Ballygally Head; Fair head (Antrim). Frequent in fruit. 11-2.—S. A. S.

* H. CUPRESSIFORME. *Dill.* VAR LACUNOSUM. *Wils.*

Warrenpoint, County Down.—Rev. C. H. Waddell.

H. FILICINUM. *Dill.*

Rostrevor Mountain, and near Moira, County Down.—Rev. H. C. Waddell.

* H. SENDTNERI. *Schp.*

Rare. Rathlin Island.—S. A. S.

* H. RIPARIUM. *Linn.*

Wet places—rare. Abundant in several places, by the Lagan Canal, above Moira, County Down.—S. A. S.

H. UNDULATUM. *Dill.*

Tollymore and Slieve Bignian, Mourne Mountains (Down).—Rev. C. H. Waddell. Rathlin Island (Antrim).—S. A. S.

H. MURALE. *Hedw.*

Walls near Belfast.—T. Drummond. In the water table, Falls Road, near Andersonstown; also, on a stone dyke, in old road, at back of Cave Hill.—S. A. S.

H. TENELLUM. *Dicks.*

Old Walls of Dundrum Castle (Down); Rathlin (Antrim).—S. A. S.

* H. FLAGELLARE. *Dicks.*

Rocky banks of mountain streams. Tollymore, Yellow Water, &c.; frequent.—Rev. C. H. Waddell. Slieve Donard, Slieve Comedagh, and frequent in the Mourne range, but always barren.—S. A. S.

* H. SPECIOSUM. *Brid.*

Rathlin Island.—S. A. S. Rare and barren.

* H. CRASSINERVUM.—*Tayl.*

Very rare. Cave Hill, near Belfast.—T. Drummond. Specimen in Belfast Museum Collections (*Musci Scotica*).

H. MYOSUROIDES. *Linn.*

Widely spread. Warrenpoint and Rostrevor.—Rev. C. H. Waddell. Slieve Donard (Down); Ballygally Head, and Glenshesk (Antrim).—S. A. S.

H. ALBICANS. *Dill.*

In fruit on sandy warren—Donaghadee, February, 1876.—S. A. S.

H. LUTESCENS. *Huds.*

Rostrevor Mountain.—Rev. C. H. Waddell. Upper end of Holywood Glen, and railway bank, Newtownards.—S. A. S.

* HETEROCLADIUM HETEROPTERUM. *Bruch.*

Very rare. Rocks by stream, Slieve Comedagh, and on rocks in the stream at upper end of Glenmachan Glen (Down).—S. A. S. Barren.

* LESKEA POLYCARPA. *Ehr.*

On bases of ash and alder trees—rare. By the Lagan Canal, above first lock, and by the Six-mile River, above Templepatrick.—S. A. S.

CLIMACIUM DENDROIDES. *Linn.*

Fruiting freely near Lisburn; October, 1877.—Mr. J. H. Davies.

PTEROGONIUM FILIFORME. *Hedw.*

Tollymore Park.—T. Drummond.

* FISSIDENS OSMUNDIOIDES. *Hedw.*

Wet mountain rocks—rare. On Slieve Croob—sparingly. In several places between Tollymore Park and Donard Lodge.—S. A. S. Fruit, April and May.

* F. EXILIS. *Hedw.*

Ditch banks—very rare. Ditch banks near Belfast.—T. Drummond, 1831. In a lane leading from Ballygomartin Road to Black Mountain.—S. A. S. It occurs sparingly on the ditch bank at upper end of lane. In fruit, March, 1880.

TETRAPLODON MNIOIDES. *Hedw.*

Crocknafeola Plantation, Mourne Mountains.—Rev. C. H. Waddell.

BARTRAMIA ITHYPHYLLA. *Brid.*

Slieve Donard, and rocks above Bryansford (Down).—S. A. S. Rising to 1600 feet.

B. ARCUATA. *Dicks.*

One stem in fruit; November, near Rostrevor.—Rev. C. H. Waddell.

ENTOSTHODON FASCICULARE. *Dicks.*

Warrenpoint (Down).—Rev. C. H. Waddell.

* E. ERICETORUM. *De Not.*

Damp rocky places by streams in the mountains—rare. Slieve Donard, at 1500 to 1800 feet.—S. A. S.

E. TEMPLETONI. *Hook. and Tayl.*

Mourne Mountains, at Rostrevor.—Rev. C. H. Waddell. Slieve Donard (Down); Rathlin Island (Antrim).—S. A. S.

FUNARIA HYGROMETRICA, VAR PATULA.

Magheralin (Down).—Rev. C. H. Waddell.

MNIUM UNDULATUM. *Hedw.*

Fruiting abundantly in the wood at Narrowwater, County Down.—Rev. C. H. Waddell.

M. ROSTRATUM. *Schrad.*

Tollymore Park.—Rev. C. H. Waddell. Castlereagh Hill (Down), and Tardree (Antrim).—S. A. S.

* BRYUM BIMUM. *Schreb.*

Rare (?) A specimen from Fair head (Antrim) seems to be this, but lacks inflorescence.—S. A. S.

B. PALLENS. *Swartz.*

Mourne Mountains.—Rev. C. H. Waddell.

B. PSEUDOTRIQUETRUM. *Hedw.*

Mourne Mountains.—Rev. C. H. Waddell. Rathlin Island.—S. A. S.

B. CARNEUM. *Linn.*

Magheralin (Down).—Rev. C. H. Waddell.

* B. ELONGATUM. *Dicks.*

Very rare. Slate rocks between Slieve Donard and Tollymore (Down). —Rev. H. W. Lett.

[AULOCOMNION ANDROGYNUM. *Schw.*

Very rare. In bogs near Ardmore (Lurgan), on weathered stumps of bog-fir.—Rev. H. W. Lett. The locality where this rare moss has been found, though in County Armagh, is on the border of our district, and may be hoped for in either Down or Antrim.]

[OLIGOTRICHUM HERCYNICUM. *Ehr.*

Very rare. Not found in our district, but collected by Rev. C. H. Waddell from rocks by stream, Anglesey Mountain, County Louth. Probably also on Mourne range.]

* DIPHYSCIUM FOLIOSUM. *Linn.*

Very rare. Slievenamaddy Mountain.—Rev. H. W. Lett. This moss, so rare in Ireland, has been found also on Anglesey Mountain, Louth, just outside our district, by Rev. C. H. Waddell.

ZYGODON RUPESTRIS. *Schp.*

Crevices of rocks on the shore at Portavo, and also, close by, on the old wall of the Donaghadee road (Down). In some plenty on the south-west wall of the Bridge on the Larne road, at Kilroot; sparingly on rocks in Rathlin Island (Antrim).—S. A. S.

* Z. VIRIDISSIMUS. *Dicks.*

On trunks of trees; widely diffused in the barren state; rare in fruit. Rostrevor (Down); Shaw's Bridge, Cave Hill, Kilroot, Magheramorne (fruit) Co. Antrim.—S. A. S.

* ORTHOTRICHUM CALVESCENS. *Wils.*

Very rare. Two tufts of this moss were collected in the district—I believe in Glensheak, County Antrim—but as the label has been lost, this species cannot be localised with entire certainty.—S. A. S.

O. LEIOCARPUM. *Br. and Schp.*

On trees, Tollymore (Down).—Rev. H. W. Lett. Base of the Sallagh Braes (Antrim).—S. A. S.

* O. SPRUCEI. *Mont.*

Very rare. On several trees and bushes by the Lagan Canal, immediately above Drum Bridge (County Down). This moss is plentiful in this, its only Irish station, where it was discovered by Mr. J. H. Davies, of Glenmore, in 1878.

* O. RIVULARE. *Turner.*

* Rare. Sparingly on trees, at Drum Bridge (County Down), with the preceding species. Discovered by Mr. J. H. Davies in 1878. Since found in abundance on rocks in Glenavy River (County Antrim), near the junction with Lough Neagh.—S. A. S.

O. STURMII. *Hoppe.*

On trees Tollymore Park, Co. Down.—Rev. H. W. Lett. Plentiful on stones, in a boggy heath, on Knocklayd Mountain, Co. Antrim, with mature and abundant fruit at latter end of April, 1882.—S. A. S.

O. CUPULATUM. *Hoffm.*

On stones in Crumlin River, and on the Gobbin Rocks, Co. Antrim.—S. A. S.

RACOMITRIUM CANESCENS. *Hedw.*

Drumcormac, at base of Slieve Gallion, Co. Derry, on the east side.—S. A. S.

* R. OBTUSUM. *Sm.* R. HETEROSTICHUM VAR. GRACILESCENS. *Bry. Eur.*

Amongst Drummond's mosses, in the Belfast Museum, is a specimen marked by himself "Racomitrium microcarpon of foreign authors—not of Bry. Brit." Subsequently it has been marked, by the hand of Dr. Taylor, "*Trichostomum microcarpon var. oblongum*," and initialed "T. T." I am indebted to Rev. John Fergusson for identifying this specimen with the *T. obtusum* of Smith, afterwards *R. obtusum* of Lindberg. Drummond's specimen was collected more than fifty years ago, and the plant does not seem to have been seen on the Mourne range since that time.

* R. PROTENSUM. *A Braun.*

Very rare. Mourne Mountains.—T. Drummond. Wet rocks in several places between Slieve Donard and Tollymore Park, Co. Down, at 1200 to 1500 feet.—S. A. S.

R. ELLIPTICUM. *Turner.*

Mountains above Newcastle, Co. Down; Benbradagh Mountain, above Dungiven, Co. Derry.—S. A. S.

GRIMMIA LEUCOPHÆA. *Grev.*

On schist, Slievnabrock—Mourne Mountains.—Rev. H. W. Lett.

G. TRICHOPHYLLA. *Grev.*

Plentiful on a glacial boulder, between the Giant's Ring and the Lagan, Co. Down.—S. A. S. Barren.

G. SCHULTZII. *Brid.*

Plentiful on basaltic rocks—Ballygally Head, Co. Antrim.—S. A. S.

G. CONFERTA. *Br. and Schp.* VAR INCANA.

Brean Mountain, Glenshesk; Rathlin Island, Antrim.—S. A. S.

ENCALYPTA STREPTOCARPA. *Hedw.*

On walls, Narrowwater and Tollymore (Down).—Rev. C. H. Waddell, In great profusion on walls of Clady Bridge, near Dunadry, Co. Antrim.—S. A. S. Always barren.

* TORTULA HIBERNICA. *Mitt.*

Very rare. To this species Mr. Holt refers a moss from Rathlin Island. It is, however, a poor, drawn out, and barren form.

T. LATIFOLIA. *Br. and Schp.*

At the bases of trees by the Lagan at Shaw's Bridge, Drum Bridge, and also on trees by the Six-mile River, above Templepatrick, Down and Antrim. —S. A. S. Barren.

* T. PAPILLOSA. *Wils.*

On trees, widely spread, but unfruitful, near Lisburn.—J. H. Davies. Greyabbey and Knock, Co. Down; Ballygomartin, and between Dunadry and Crumlin, County Antrim.—S. A. S. Barren.

T. LÆVIPILA. *Brid.*

Common in Down, Antrim, and Derry; occurring on trees, walls, and rocks.

* T. PALLAX, *Hedw.*, VAR. BREVIFOLIA.

Rare (?) Wet rocks by stream in Cregagh Glen, near Belfast.

T. RIGIDULA. *Dicks.*

Limestone rocks and moist banks near Belfast. — T. Drummond. Chalk rocks—Ballysillan, near Belfast; Rathlin (Antrim), Slieve Gallion (Derry).—S. A. S.

T. INSULANA. *Det Not.*

Divis Mountain.—Rev. C. H. Waddell.

* T. ATROVIRENS. *Sm.*

Very rare. A very small tuft was found on rocks by the shore, Rathlin Island.—S. A. S.

T. ALOIDES. *Koch.*

Walls, Narrowwater, County Down.—Rev. C. H. Waddell.

T. STELLATA. *Schreb.*

On clay, in crevices of slate rocks, Cregagh Glen, near Belfast.—S. A. S. A few capsules only, 12/2/77, and again in January, 1880.

TRICHOSTOMUM HOMOMALLUM. *Hedw.*

On micaceous rocks on Brean Mountain, above Glenshesk, Co. Antrim.—S. A. S.

* T. FLEXICAULE. *Schwg.* VAR DENSUM. *Schp.*

Very rare. On peat, Divis Mountain, near Belfast.—Rev. C. H. Waddell.

* T. LITTORALE. *Mitt.*

Very rare (?) On rocks by the shore, Rathlin Island, Co. Antrim.—S. A. S.

* T. CRISPULUM. *Bruch.* VAR ELATUM. *Schp.*

Very rare. Sparingly on rocks in Rathlin Island.—S. A. S. (Var. not found elsewhere in Ireland).

T. MUTABILE. *Bruch.*

Abundant on chalk rocks at Whitepark Bay, Ballintoy; sparingly on Fairhead, Antrim.—S. A. S. No fruit.

POTTIA HEIMII. *Br. and Schp.*

Rocks by the shore, south of Newcastle (Down); Rathlin (Antrim).—S. A. S.

* P. ASPERULA. *Mitt.*

Very rare. In an old sandpit by the Groomsport Road, close to the Warren, Donaghadee (Down); ledges of basaltic rocks at Blackhead (Antrim); sparingly in both places. Fruit in January and February.—S. A. S. Referred to the above species with some hesitation. The three *Pottias* of Mitten are perilously near to each other.

* CAMPYLOPUS SCHWARZII. *Schp.*

Very rare. Tievedocharrah, between Rostrevor and Hilltown, Mourne Mountains.—Rev. H. W. Lett.

C. FLEXUOSUS. *Brid.*

Benerom, Mourne Mountains.—Rev. H. W. Lett. Mountains above Bloody Bridge, Down, and on Knocklayd, Antrim.—S. A. S. In fine fruit June, July, and August.

* C. ATROVIRENS. *De Not.*

Splashy, wet places on rocky moors; rather rare. Rocky Mountain, Mourne range.—Rev. W. H. Lett. Slieve Donard, Down, and Knocklayd, Antrim.—S. A. S. Barren.

DICRANUM BONJEANII. *De Not.*

Rathlin Island. Sparingly.—S. A. S.

* D. SCOTTIANUM. *Turner.*

Mourne Mountains.—T. Drummond.

* D. RUFESCENS. *Turner.*

Rare. Crown Mountain, near Newry, Co. Down.—Rev. C. H. Waddell. Sandbanks near Belfast.—T. Drummond. Mountain above Glensheak, Co. Antrim, on mica-schist.—S. A. S.

D. CERVICULATUM. *Hedw.*

Rathlin Island, Glensheak, and frequent in turf bogs.—S. A. S.

D. SQUARROSUM. *Schrad.*

Rostrevor, Co. Down.—Rev. C. H. Waddell.

D. CRISPUM. *Hedw.*

Sandstone Rock, Derriaghy.—J. H. Davies. Plentiful on sandy bank between the Botanic Gardens and the Stranmillis Road, Belfast; also, on crumbling mica-schist above Glensheak, Antrim.—S. A. S.

D. PELLUCIDUM. *Linn.*

Slieve Donard (Down), Slieve Gallion, and Carndaisy Glen, near Moneymore (Derry).—S. A. S.

BLINDIA ACUTA. *Br. and Schp.*

Wet places on mountains and by rocky streams; abundant where it occurs. Mourne Mountains.—Rev. C. H. Waddell. Abundant on mountains above Newcastle, Down, and on Knocklayd, Antrim.—S. A. S.

* ANODUS DONIANUS. *Sm.*

Very rare. On Greensand rocks, by the stream, at the top of a little fall in Upper Collin Glen, near Belfast. In good fruit on 19th June, 1876.—S. A. S. Not found elsewhere in Ireland.

* RHABDOWEISSIA DENTICULATA. *Brid.*

Crevices of rocks, very rare. Rocks on ascent of Slieve Donard by the Glen River, and between Donard and Tollymore (Down), also sparingly on summit of Slemish (Antrim).—S. A. S.

R. FUGAX. *Hedw.*

Slievenabrock, between Tollymore and Donard, Co. Down.—Rev. H. W. Lett.

WEISSIA VERTICILLATA. *Brid.*

Limestone rocks, Rathlin Island.—S. A. S.

W. CRISPULA. *Hedw.*

Rocks and boulders, between Rostrevor and Hilltown, Co. Down.—Rev. H. W. Lett.

W. CIRRHATA. *Hedw.*

Mourne Mountains, near Hilltown.—Rev. H. W. Lett. West side of Bencrom, Mourne Mountains.—Rev. C. H. Waddell. Some fine tufts on boulders, on the mountain above Rostrevor Church—October, 1876.—S. A. S.

PHASCUM CUSPIDATUM. *Schreb.*

Rathlin Island.—S. A. S.

SPHAGNUM PAPILLOSUM. *Lindb.*

Wet rocks, not common (?) On rocks on the mountains, above Bloody Bridge (Down), and sparingly on Rathlin (Antrim).—S. A. S.

S. SUBSECUNDUM, *Nees*; VAR CONTORTUM, *Schultz.*

Wet rocks; rare. Plentiful on granite rocks in the mountains, above Newcastle, Co. Down.—S. A. S.

ANDRÆA PETROPHILA. *Ehr.*

Slieve Donard (Down), and on basalt, Cave Hill (Antrim), at 700 feet.—S. A. S.

APPENDIX VIII.

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I. NOTES ON IRISH COLEOPTERA,

BY A. L. HALIDAY, F.L.S.

EDITED BY S. A. STEWART, F.B.S., Edin.

II. THE CROMLECHS OF ANTRIM AND DOWN,

BY WILLIAM GRAY, M.R.I.A.

III. NOTES ON THE PRE-HISTORIC MONUMENTS,

AT CARROWMORE, NEAR SLIGO:
THE BATTLE-FIELD OF THE NORTHERN MOYTURA.

BY MR. CHARLES ELCOCK.

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NOTES ON IRISH COLEOPTERA,

By A. L. HALIDAY, F.L.S.

Edited by S. A. STEWART, *Fellow of Botanical Society of Edinburgh.*

THE following list has been prepared from manuscript notes made by the late A. L. Haliday, F.L.S. The MS. has been in the possession of the Editor for many years, and as a record of work done by one, who, in his day, ranked amongst the foremost of British entomologists, it has seemed a duty to give it to the public.

Mr. Haliday was one of an illustrious band of naturalists whose love for scientific research, and success in the pursuit, conferred distinction on the town of Belfast during the earlier portion of the present century. It is matter for regret that, with respect to the labours of these local pioneers of science, so little has been put upon record, and that their personal history is, in some cases, imperfectly known to their successors. We do know, however, that they were single-minded lovers of Nature, anxious only for a better knowledge of her ways, and careless as to whether their names should, in all cases, be associated with the discoveries they made.

Many of the species in the following enumeration have been noted, as Irish, in Curtis's Illustrations of British Entomology, but the greater part would seem to have remained unpublished.

The nomenclature is that of the MS., without alteration, but in such cases as where an insect appears under a different name in Stephens' British Entomology, the Editor has appended the latter as a synonym.

Mr. Haliday had three distinct marks, which, placed against the names of the species in a classified list, constituted his method of recording the localities of his captures. The first mark signified "near Belfast"; the second, "elsewhere in Ireland"; the third, "English." No further details are given. As we are not concerned with the English distribution, the two first only are reproduced here. These notes extend to *Hymenoptera*, and other groups, but being, as regards these, incomplete, and lacking localities are consequently omitted.

SCARITIDÆ. N.B. *signifies Near Belfast*; E.I., *Elsewhere in Ireland.*	N.B.	E.I
Clivina fossor	*	
Dyschirius politus	*	
.. gibbus[1]		*
.. minimus Curt.	*	
Cychrus rostratus	*	
Carabus catenulatus	*	
.. nemoralis Ill.	*	
.. arvensis	*	
.. cancellatus	*	
.. glabratus	*	
.. nitens	*	
Pogonophorus (Leistus Fœh.) fulvi barbis	*	
.. brunneus[2]	*	
.. spini labris	*	
Helobia brevicollis	*	
.. nivalis Deg.	*	
Pelophila borealis[3]	*	
Blethisa multipunctata	*	
Elaphras cupreus	*	
.. riparius	*	
Notiophilus aquaticus	*?	
.. quadripunctatus	*	
.. biguttatus	*	
Bembidion paludosum	*	
Tachypus striatus	*	
.. andreæ	*	
.. bipunctatus	*	
Thous celer	*	
.. pygmæus		*
Lopha doris	*	
.. pusillus ?	*	
.. assimilis	*	
Peryphus littoralis	*	
.. femoratus	*	
.. viridi-æneus	*	
.. fuscipes	*	
.. atrocæruleus		*
Notaphus bifasciatus		*
Tachys obtusus	*	
.. immunis	*	
.. pusillus	*	
Lega ænea[4]	*	
.. fuscifres	*	
Ocys currens	*	

[1] The statement in Curt. Brit. Ent. that D. *gibbus* was found by Mr. Haliday, near Belfast, does not accord with Haliday's MS., which is as above. Ed.

[2] Curtis gives *brunneus* as a synonym for *spini labris*, perhaps *rufescens* was meant by Haliday.

[3] P. *borealis* Payk. was figured by Curtis from a specimen in Mr. Haliday's Cabinet, taken on the sandy shore of Lough Neagh by Mr. Robert Templeton, on 14th June, 1829.

[4] Philocthus, Stephens' Brit. Ent.

SCARITIDÆ.—*Continued.*	N.B.	E.I.
Blemus paludosus	*	
Trechus suturalis	*	
.. fulvus	*	
.. ruficollis	*	
.. minutus, F. aquaticus Marsh.	*	
Ophonus puncticollis	*	
.. pubescens	*	
Harpalus ruficornis	*	
.. rubripes	*	
.. rufimanus	*	
.. æneus	*	
.. dentatus	*	
Badister lacertosus	*	
.. humeralis	*	
Loricera pilicornis	*	
Anchomenus albipes	*	
.. prasinus	*	
.. oblongus	*	
Agonum picipes	*	
.. pullum ?	*	
.. Simpsoni	*	
.. mœstum ?	*	
.. viduum	*	
.. parumpunctatum	*	
.. rotundatum	*	
Synuchus nivalis	*	
Calathus piceus	*	
.. frigidus[1]	*	
.. melanocephalus	*	
.. nubigena. M.	*	
Amara acuminata	*	
.. vulgaris	*	
.. eurynota	*	
.. communis	*	
.. familiaris	*	
.. crassa	*	
.. tibialis, *mihi*	*	
Bradytus apricarius	*	
Cyrtonotus piceus	*	
Chlænius nigricornis	*	
Pristonychus subcyaneus	*	
Stomis pumicatus	*	
Patrobus rufipes	*	
Steropus madidus	*	
Pœcilus versicolor	*	
.. rutilans	*	
.. cupreus	*	
.. ruffifemoratus	*	
Omaseus melanarius	*	

[1] *Clairvilloides*, Ill., *fuscipes* Gmel., *flavipes*, and *obscurus* Marsh. Ed.

SCARITIDÆ.—*Continued.*	N.B.	E.I.
.. nigrita	*	
.. rufifemoratus	*	
.. tetricus[1]	*	
.. Bulweri	*	
Argutor vernalis	*	
.. erythropus	*	
.. anthracinus[2]	*	
Platysme nigra	*	
Abax striola	*	
Dromia melanocephala	*	
.. meriodionalis	*	
.. 4maculata	*	
.. linearis	*	
.. punctatula		*
Lamprias chlorocephas		*
GYRINIDÆ.		
Gyrina æneus	*	
.. natator	*	
.. minutus	*	
DYTICIDÆ.		
Dytiscus marginalis	*	
.. punctulatus	*	
Acilius sulcatus	*	
Colymbetes fuliginosus	*	
.. agilis	*	
.. bipunctatus	*	
.. obscurus	*	
.. Sturmii	*	
.. paludosus	*	
.. bipustulatus	*	
.. chalonotus	*	
.. striatus	*	
Laccophilus minutus	*	
Noterus sparsus	*	
.. crassicornis	*	
Hygrotus confluens	*	
.. reticulatus	*	
.. inequalis	*	
Hydroporus scitulus[3]	*	
.. minimus	*	
.. pictus	*	
.. lineatus	*	

[1] This beetle was first discovered and named by Mr. Haliday: it was described by him from specimens taken near Belfast.

[2] *Omaseus minor* Dej., Curtis Brit. Ent.

[3] H. *scitulus*, H. *pictus*, and H. *fluviatilis* are placed by both Curtis and Stephens under *Hygrotus*.

	N.B.	E.I.
DYTICIDÆ.—*Continued.*		
.. erythrocephalus	*	
.. triguttatus	*	
.. planus	*	
.. nigrita	*	
.. melanocephalus	*	
.. geminus	*	
.. rufifrons	*	
.. fluviatilis	*	
Haliplous ferrugineus	*	
.. impressus	*	
.. ruficollis	*	
.. affinis	*	
PARNIDÆ.		
Parnus sericeus	*	
.. auriculatus	*	
HELOPHORIDÆ.		
Octhebius hibernicus[1]	*	
.. impressus	*	
.. maritimus	*	
Helophorus aquaticus	*	
.. granularis	*	
.. griseus	*	
.. nubilus	*	
.. dorsalis	*	
HYDROPHILIDÆ.		
Limnebius mollis	*	
.. truncatellus	*	
.. ater	*	
.. picinus	*	
Hydrobius fuscipes	*	
.. orbicularis	*	
.. ochropterus	*	
.. melanocephalus	*	
.. lividus[2]	*	
.. bipustulatus	*	
.. minutus	*	
.. globulus	*	
.. picipes	*	

[1] The specimen figured for this species in Curt. Brit. Ent. was taken by Mr. Ha day on rushes on the shore of Belfast Bay.

[2] H. *griseus* Herb. ?, Marsh ?, Oliv., Curt. Brit. Ent.

	N.B.	E.I.
SPHÆRIDIADÆ.		
Spheridion scarabæoides	*	
... marginatum	*	
... bipustulatum	*	
... lunatum	*	
Cercyon littorale	*	
... atomarium	*	
... hemorrhoidale	*	
... melanocephalum	*	
... pygmæum	*	
... terminatum	*	
... centrimaculatum	*	
... quisquilium	*	
ANISOTOMIDÆ.		
Anisotoma ferrugineum[1]	*	
... cinnamomeum	*	
... dentipes	*	
Clambus armadillus		
SCAPHIDIADÆ.		
Cypha	*	
Sericoderus thoracicus		*
Clypeaster cassidioides		*
Catops rufescens	*	
... sericeus	*	
... agilis[2]	*	
... fornicatus	*	
Melegethes rufipes	*	
... senea	*	
Nitidula varia	*	
... colon	*	
... sordida	*	
... discoidea	*	
... bipustulata	*	
... obsoleta	*	
... silacea	*	
Catheretes caricis	*	
... rufilabrum	*	
... urticæ	*	
SILPHIDÆ.		
Phosphuga subrotundata	*	
Silpha opaca	*	
Oiceoptoma rugosa	*	
... sinuata	*	
Necrophorus humator	*	
... vespillo	*	
... vestigator	*	
Throscus dermestoides	*	

[1] This, and the following species were placed by Curtis, and also by Stephens under *Leiodes*.

[2] *Choleva agilis*, Stephens' Brit. Ent.

ENGIDÆ, Etc.	N.B.	E.I.
Ips quadripustulatus[1]	•	
Antherophagus silaceus	•	
Mycetia fumata	•	
Biturus tomentosus	•	
Cryptophagus lycoperdi	•	
... fumatus	•	
... ulicis	•	
... cellaris	•	
Atomaria ater	•	
... fuscipes	•	
... pheogaster	•	
... caricis	•	
... globulus	•	
... hirta[2]	•	
... trichopteryx	•	
Corticaria ferruginea	•	
Latridius rugicollis	•	
... impressus	•	
... transversus	•	
... ruficollis	•	
Micropeplis porcata	•	
... tesserula[3]	•	
... staphylinoides	•	
Byrrhus varius	•	
... pilula		•
Semplocaria semistriata	•	
Hister carbonarius	•	
... cadaverinus	•	
... unicolor	•	
... purpurascens	•	
... 12 striatus	•	
... seneus	•	
... nitidulus	•	
Monotoma juglandis[4]	•	
Onthophilus striatus	•	
Abreus globusus ..	•	
Staphylinus pubescens	•	
.. nebulosus	•	
.. minimus	•	
.. castanopterus	•	
.. brunnipes	•	
.. erythropterus	•	
.. seneocephalus	•	

[1] The mark placed by Mr. Haliday opposite this name has been blotted, and there is some doubt as to what was intended.

[2] *Atomaria hirta*, Curt. Brit. Ent.

[3] Discovered and named by Mr. Haliday. The specimen figured by Curtis was taken out of a pond in the County of Down, near Belfast, in Feb., 1827.

[4] *Synchyta Juglandis*, Stephens' Brit. Ent.

ENGIDÆ, Etc.—*Continued.*	N.B.	E.I.
Philonthus splendens	*	
.. laminatus	*	
.. æneus	*	
.. decorus	*	
.. politus	*	
.. marginatus	*	
.. aterrimus	*	
.. bipustulatus	*	
.. sanguineolatus	*	
.. opacus	*	
.. punctus	*	
.. varius	*	
.. fimetarius	*	
Cafius xantholoma	*	
Bionius cephalotes ?	*	
Gabrius nanus	*	
Creophilus maxillosus	*	
Othius ? fulminans	*	
Gyrohypnus cruentatus	*	
.. longiceps	*	
.. linearis	*	
.. punctulatus	*	
.. ochraceus	*	
Lathrobium fulvipenne	*	
.. elongatum	*	
.. brunnipes	*	
.. quadratum	*	
Sunius melanocephalus	*	
Stenus bipunctatus	*	
.. oculatus	*	
.. flavicornis[1]	*	
.. pubescens	*	
.. boops	*	
.. fuscipes	*	
.. circularis	*	
Tachyporus pusillus	*	
.. pubescens	*	
.. hypnorum	*	
.. abdominalis	*	
.. bipustulatus	*	
.. marginellus	*	
Tachinus silphoides	*	
.. subterraneus	*	
.. pullus	*	
.. rufipes	*	
.. marginellus	*	
Hesperophilus hæmopterus	*	
.. cœlatus	*	
Oxytelus rugosus	*	

1 Query *fulvicornis.*

ENGIDÆ, Etc.—*Continued.*	N.B.	E.I.
.. carinatus	*	
.. piceus	*	
.. laqueatus	*	
.. depressus	*	
.. sculpturatus	*	
.. morsitans[1]	*	
Elonium rugosum	*	
Bolitobius lunulatus	*	
.. atricapillus	*	
.. cernuus	*	
.. analis	*	
.. merdarius	*	
Callicera vernalis[2]	*	
Megarthrus depressus	*	
.. flavus	*	
Aleochara fuscipes	*	
Proteinius brachypterus	*	
Antholobium melanocephalum	*	
.. tectum	*	
.. grossum[3]	*	
Omalium deplanatum	*	
.. rivulare	*	
Lesteva caraboides	*	
.. punctulata	*	
.. obscura	*	
Drusilla canaliculata[4]	*	
Pselaphus Herbsteri	*	
Falagria sulcata	*	
Tychus niger	*	
Autalia rivularis	*	
.. impressa	*	
Bryaxis juncorum	*	
.. sanguinea	*	
Encephalus complicans	*	
Anthicus floralis	*	
Anaspis lateralis	*	
.. ruficollis	*	
.. obscura[5]	*	
Salpingus planirostris	*	
Meloe violacea	*	

1 *Platystephus morsitans*, Step. Brit. Ent.

2 *Callicerus Spencii.* "Taken at Holywood in the shelter of furze bushes; in the first burst of spring I have found it abundant on the fresh grass of sunny banks."

A. L. Haliday, Curt. Brit. Ent.

"C. *hybridus* Hal. MS A single specimen taken at Holywood with the preceding species by Mr. Haliday," Curt. Brit. Ent.

3 A. *piceum*, Step. Brit. Ent.

4 *Astilbus canaliculatus*, Step. Brit. Ent.

5 A. *melanopa*, Step. Brit. Ent.

ENGIDÆ, Etc.—*Continued.*	N.B.	E.I.
Trogosita mauritanica	•	
Atopa cervina	•	
Cryphon melanurus	•	
.. marginatus	•	
.. griseus	•	
Malthinus flaveola	•	
.. biguttatus	•	
.. brevicollis	•	
.. minimus	•	
Thelephorus fulvicollis	•	
.. testaceus	•	
.. pallidus	•	
.. bicolor	•	
.. melanurus	•	
.. æthiops	•	
Elater nigroæneus	•	
... testaceus[1]	•	
.. niger	•	
.. riparius[2]	•	
.. 4 pustulatus		•
Ctenioceras cupreus	•	
Hemirhipus marginatus[3]	•	
.. limbatus	•	
.. segetis	•	
... obscurus	•	
Corynetes quadra	•	
Anobium rufipes[4]	•	
.. striatum	•	
Ptinus fur	•	
.. crenatus	•	
.. testaceus	•	
Cis boleti	•	
.. nitidus	•	
Hylurgus ater	•	
.. ulicis	•	
.. piniperda	•	
Rhizobius litura	•	
Cacidula pectoralis	•	
Coccinella 7 punctata[5]	•	
.. 14 guttata	•	
.. variabilis	•	
.. conglobata	•	
.. 11 notata	•	
.. 13 punctata	•	
.. 22 punctata	•	

1 *Aplotarsus testaceus*, Step. Brit. Ent.

2 This, and the succeeding species stand under *Hypnoidus* in Stephens' Brit. Ent.

3 *Cataphagus*, Stephens' Brit. Ent.

4 Death-watch.

5 Lady-bug.

ENGIDÆ, Etc.—*Continued.*	N.B.	E.I.
.. 18 guttata	*	
.. 11 punctata	*	
.. 14 punctata	*	
Scymnus discoideus	*	
Cassida viridis	*	
.. rubiginosa	*	
Helodes phellandrii	*	
Timarcha coriaria	*	
Chrysomela margenella[1]	*	
.. cochleariæ	*	
.. betulæ	*	
.. vitellina	*	
.. polygoni	*	
.. raphani	*	
.. polita	*	
.. staphylœa	*	
.. Banksii	*	
Galeruca tanaceti	*	
.. capreæ	*	
Haltica testacea[2]	*	
.. tabida	*	
.. lutescens	*	
.. parvula	*	
.. lurida	*	
.. cærulea	*	
.. nemorum[3]	*	
.. 4 pustulata	*	
.. crucæ	*	
.. oleraceæ	*	
.. atricilla	*	
.. fuscipes	*	
.. lepidii	*	
.. orbiculata	*	
.. dentipes	*	
.. helxines	*	
.. aurata	*	
.. rufipes	*	
.. transversa	*	
.. exoleta	*	
.. nigricollis	*	
.. sordida	*	
.. hyoseiami	*	
.. affinis	*	
Lema puncticollis[4]	*	
.. cyanella	*	
Leptura lævis	*	

1 Includes *Phædon* of Stephens' Brit. Ent.
2 Under *Haltica* we have here insects of the genera *Haltica*, *Thyamis*, *Macronema*, and *Sphæroderma* of Stephens' Brit. Entomology.
3 This minute beetle is the destructive "Turnip Fly."
4 Crioceras, Step. Brit. Ent.

ENGIDÆ, Etc.—*Continued.*	N.B.	E.I.
.. femorata	•	
.. elongata	•	
Cerambyx moschatus[1]	•	
Pogonocerus nebulosus	•	•
.. hispidus		•
Bruchus granarius		•
Apion nigritarse		
.. pallipes	•	
.. flavifemoratum[2]	•	
.. vicise	•	
.. hydrolapathi	•	
.. hæmatodes	•	
.. gibbirostre[3]	•	
.. ervi	•	
.. craccæ	•	
.. æneus	•	
.. vorax	•	
Rhynchites alliariæ		•
.. nanus		•
Ramphus? pulicarius		
Tachyerges salicis[4]	•	
Orchestes fagi	•	
.. ferrugineus	•	
.. scutellaris	•	
Tychius cinerascens	•	
Hypera nigrirostris	•	
.. polygoni	•	
.. plantaginis	•	
.. rumicis	•	
.. punctata	•	
.. miles	•	
.. pollux	•	
Notaris acridulus	•	
Leiosoma punctata	•	
Hylobius abietis	•	
Barynotus mercurialis	•	
Alophus van	•	
Bagous Lathburii	•	
Mecinus semicylindricus	•	
Dorytomus tortrix	•	
.. pectoralis	•	
.. maculatus[5]	•	
Anthonomus pomarium	•	
.. fasciatus	•	
.. ulmi	•	
Balaninus salicivorus	•	
Cionus scrophulariæ	•	
Orobitis globosus	•	
Sphærula lythri	•	

1 *Aromia moschata*, Curt. Brit. Ent. 2 A. *apricans*, Step. Brit. Ent. 3 A. *carduorum*, Curt., and also Step. Brit. Ent. 4 *Orchestes salicis*, Curt. Brit. Ent. 5 D. fumosus, Step. Brit. Ent.

ENGIDÆ, Etc.—*Continued.*	N.B.	E.I.
Gryphidius equiseti	*	
Rhinonchus pericarpius	*	
.. castor	*	
.. 4 tuberculatus	*	
Nedyus boraginis	*	
.. pollinarius	*	
.. eryaimi	*	
.. contractus	*	
.. assimilis	*	
.. troglodytes	*	
Ceuthorrhynchus sulcicollis	*	
.. didymus	*	
Pachyrhinus leucogaster	*	
Phyllobius argentatus	*	
.. parvulus	*	
Polydrusus micans	*	
.. flavipes	*	
.. oblongus[1]	*	
Sitona hispidula	*	
.. cannia	*	
.. lineata	*	
.. lineela	*	
.. tibialis	*	
Strophosomus coryli	*	
Liophlæus nubilus	*	
Cossonus Tardii	*	
Calandra granaria[2]	*	
Serica brunnea	*	
Anomala horticola[3]	*	
Melolontha vulgaris[4]	*	
Typhæus vulgaris		*
Geotrupes vernalis		*
.. sylvaticus	*	
.. stercorarius	*	
Aphodius fossor	*	
.. fimetarius	*	
.. terrestris	*	
.. subterraneus	*	
.. granarius	*	
.. prodromus	*	
.. sphacelatus	*	
.. contaminatus	*	
.. nigripes	*	
.. rufescens	*	
.. merdarius]	*	
.. granum	*	
.. turpis	*	

1 *Nemoicus oblongus*, Step. Brit. Ent. 2 Corn Weevil. 3 *Anisoplia horticola*, Curt. Brit. Ent. 4 Cockchafer.

(Proceedings Belfast Naturalists' Field Club.—Appendix 1883-1884.*)*

THE CROMLECHS OF ANTRIM AND DOWN:

By WILLIAM GRAY, M.R.I.A.,

Ulster Provincial Secretary Royal Historical and Archæological Association of Ireland.

THE gradual decay, and, in too many instances, the complete destruction of our ancient monuments, must be deplored by every Irishman who truly loves his country.

The plough, the spade, and the chisel have been employed in removing many of our pre-historic remains, because in this utilitarian age they have been considered impediments to modern improvements.

Some have been destroyed by the injudicious zeal of professed archæologists, and some by the thoughtless frolic of holiday excursionists.

The destruction that has already taken place and continues unchecked, suggests the desirability, if not the absolute necessity, for some protective measures such as may be secured by Parliamentary enactment.

With this view a Bill has been frequently introduced into the House of Commons by Sir John Lubbock and others; their laudable efforts have not as yet resulted in legislation on the subject. Let us hope that the enlightened spirit of the age will

swell the number of Sir John Lubbock's supporters, and that the time is not far distant when we shall have our ancient monuments under the protection of the Crown, and secure from the decay to which they are now exposed.

Anticipating such an event, it is most desirable that we should have some complete catalogue or schedule of the ancient monuments of all kinds at present existing in Ireland.

Already certain lists have been prepared—in England, by a Committee of Archæologists, selected by the Society of Antiquarians; in Scotland, by the Society of Antiquarians of Scotland; and in Ireland, by the Royal Irish Academy.

Notwithstanding the efficiency of these organisations, and the ability of the several archæologists employed, the schedules prepared were very far from complete, especially for Ireland, mainly because there was no systematic effort hitherto made to catalogue the monuments existing in this country.

The appeal for contributions to this end, made in the 4th vol. of the *Ulster Journal of Archæology*, met with no response.

Doubtless, descriptions of all the more important structures may be found scattered throughout works of history and archæology, or in the transactions of learned societies; but an attempt to tabulate the records thus available would not be so useful as a catalogue compiled from recent personal observation, whereby the *present number and condition* of our ancient monuments could be accurately set forth.

The following contribution has been prepared under a conviction that, with our available organisations and the number of public officials now engaged throughout the country, a complete catalogue of all our Irish ancient monuments could be readily compiled, and the author hopes he may be able to render some assistance in this direction, particularly for the North of Ireland.

In an undertaking of this kind it is necessary that the several monuments should be grouped under separate headings, according to their most distinctive characters. This systematic classification of the monuments would facilitate the distribution of the work to be done, and secure a more satisfactory result.

IRISH CROMLECHS.

In the absence of any fixed code of terms, the author, like many other writers on the subject, has to make his own selection, and having undertaken to catalogue "The Cromlechs of Antrim and Down," it will be necessary, in the first instance, to settle what is to be understood by the term "Cromlech." This is all the more necessary because of the conflict of opinion entertained by archæologists with reference to the proper application of the term.

The opinion that prevails most commonly among the country people is, that the monuments were built by the Druids as altars. An exposition of this erroneous idea is given in the *Dublin Penny Journal*, 31st May, 1834, page 381, where the writer says :—

"This species of rude altar is very common in many parts of Ireland; it is called both in the Irish and old British language 'Crom liagh' and 'Crom-lecht,' which signify in both a crooked stone, not from any crookedness, but from their inclining posture. They are supposed to have been so formed, in order to allow the blood of the victims slain upon them to run off freely."

O'Curry, in his lectures,* refers to these monuments as "vulgarly called Cromlechs," and says "they never were intended, and never were used as altars or places of sacrifice of any kind, that they were not in any sense of the word 'Druidical,' and that they were in every instance simple sepulchres or tombs, each marking the grave of one or several personages."

Professor Nilsson says—"They are called in Scania, *dös*, in Denmark, *dyss*, in England, *cromlech*, and in France, *dolmen*." †

The Rev. H. Rowland, in his work on the Isle of Anglesea,‡ says :—

"These altars of stone (where stone served to raise them up) were huge, broad, flattish stones, mounted up and laid flat upon

* O'Curry's Lectures on Ancient Irish History. Page 597.

† S. Nilsson on the Stone Age. Page 159.

‡ Mona Antiqua Restaurata. Dublin, 1723. Page 47.

other erect ones, and leaning, with a little declivity in some places, on those pitched supporters, which posture, for some now unaccountable reasons, they seem to have affected, and were and are to this day vulgarly called by the name of 'Cromlech,' either from their bending position, which is generally believed, or rather (that bending posture being not always to be found in everyone of those monuments, nor, indeed, applicable to the idea and notion of 'Crom' in our language) that these first men (I shall adventure to guess) carried the name with them from Babel, as they did several other words, and called it 'Caeraem-lech,' from the Hebrew 'Caerem-luach,' a devoted stone or altar."

In Owen Connellan's edition of the Four Masters* we have the following note:—

"The name Cromleac signifies the stone of Crom, and they were so called from being used in the worship of Crom, one of the deities of the Irish Druids, said to represent Fate; or, according to Lanigan and others, the god of fire, or the sun, and sometimes called Crom Dubh, or Black Crom, and Crom Cruach, signifying Crom of the Heap of Stones or Cairns, as quoted by Lanigan from the Tripartite Life of St. Patrick; and the Idol of Crom Cruach, as stated in Lanigan and O'Flaherty's Ogygia, quoting from the Four Masters, and also in the Book of Invasions, by the O'Clerys, was destroyed by St. Patrick in the temple of the Druids, on Magh Sleacht, in Brefney, now Fenagh, in Leitrim; and the last Sunday of summer is still called Domhnach Chrom Duibh, or the Sunday of Black Crom, being sacred to St. Patrick as the anniversary commemorating the destruction of the idol. This is the real origin of the name Cromleac, and not from the stones being in a sloping position, as absurdly stated by some writers, and derived fron the opinions of the common people."

Sir John Lubbock says:—"Cromlech is derived from 'Crom,' a circle, and 'lech,' a stone, and Dolmen from '*daul*,' a table, and '*maen*' a stone;" and, with reference to the terms, adds—"They

* The Four Masters. By Owen Connellan. Page 271.

should, therefore, certainly be used as in the text—that is, that the word 'Cromlech' should include stone *circles*, and 'Dolmen' should be applied to stone *chambers*."*

The terms *Cromlech* and *Dolmen* may be almost etymological equivalents, yet the adoption of the term "*Dolmen*" would not be sufficiently distinctive for our purpose, because the Continental archæologists include several kinds of monuments under that denomination. The term is not of Celtic origin, and it does not harmonise with Irish words. Mr. Edward T. Stevens, in "Flint Chips,"† describes chambered tumuli under the name of Dolmens. It will be observed that the authors just quoted employ both the terms, "Dolmen" and "Cromlech," in a generic rather than in a specific sense, and describe a great variety of monuments under the respective terms. See also "Essai sur les Dolmens," by Baron de Bonstetten, of Geneva. Dr. Lukis, who has done good service in exploring the ancient monuments of the Channel Islands, would include all our cromlechs under the general term "chambered tumuli," being of opinion that all were at one time of their history covered.‡

In the first volume of the "Royal Irish Academy Museum Catalogue," the author, Sir W. Wilde, referring to the chamber found in Phœnix Park, says:—"This discovery went far to establish the belief that cromlechs were but uncovered tumuli, which originally contained sepulchral remains." Llewellyn Jewett adopts the theory of Dr. Lukis, and says that researches "prove beyond doubt that the cromlechs are neither more nor less than sepulchral chambers denuded of their mounds."§ On this point Mr. Ferguson, a well qualified authority, maintains a contrary opinion, and in his work on Rude Stone Monuments, says—"It seems impossible to believe that the bulk of those we now see were ever hidden by an earthen covering."‖

* Pre-historic Times. By Sir John Lubbock. Page 104.

† Flint Chips. A Guide to Pre-historic Archæology. Page 105.

‡ Rev. W. C. Lukis, Norwich. Vol. of Pre-Historic Congress. Capt. Oliver, R.A., "Megalithic Structures of the Channel Islands."

§ Grave Mounds and their Contents. Page 51.

‖ Rude Stone Monuments in all Countries. By James Ferguson, D.C.L., F.R.S. London, 1872. Page 44.

If modern research had demonstrated that all cromlechs were originally only chambers of tumuli, it would still be advisable to use a term expressive of their *present condition*. For this purpose the author considers the term "Cromlech" would be the most appropriate.

The original condition of all cromlechs as chambers in tumuli is now incapable of proof, either in Great Britain or the Continent; it would, therefore, be very unwise to adopt a term that would express and perpetuate what must be only a conjectural idea of the original condition of these monuments.

This is a fatal objection to the position taken by Dr. Lukis, in his controversy on the subject with Mr. Du Noyer, in which the former suggests that the terms "Cromlech" and "Dolmen" should be discarded, and the term "Chambered Tumulus" substituted, employing this term in a generic sense.*

Mr. Du Noyer, in common with Sir Gardiner Wilkinson and Colonel Meadows Taylor,† adopts the term "Cromlech," but limits it very properly to a distinct form of monument, and states his reasons in a most exhaustive and valuable communication, published in the journal of the Kilkenny Archæological Society.‡

But the restrictions imposed by Mr. Du Noyer are embarrassing and confusing, because he would limit the term "Cromlech" to such monuments as have been always *sub-œrial*—a character that is incapable of proof in any case; and he further perplexes the matter by suggesting that the cromlechs were not in themselves places of sepulchre—an opinion quite untenable. See extract from O'Curry's lectures quoted above. Besides, the character of the remains and objects found in the chambers of so many Cromlechs proves they were places of sepulchre.

Objections have been urged against the use of the term "Cromlech," because of its modern introduction, and because

* Journal of Kilkenny Archæological Society. Vol. V., page 495.

† Transactions of the Royal Irish Academy. Vol. XXIV. Part 5. 1865.

‡ Journal of Kilkenny Archæological Society. Vol V. N.S. Page 474.

such a term is not known generally among the Irish-speaking people; but such objections are not feasible, because it is only modern systematic classification that requires special specific terms, and such terms are not commonly employed by the people. The popular terms applied to ancient monuments even of the same class are nearly as varied as the localities in which the monuments occur. It should be noted, however, that in Ireland the prevailing idea involved in local names for cromlechs is that of a *bed* or final *resting place.*

If we refer to the ancient Irish manuscripts, we will find that the sepulchral monuments referred to under the generic term "Leacht," include the group we call "Cromlechs."

Dr. Sullivan, in his introduction to O'Curry's lectures on the manners and customs of the ancient Irish, says:—

"The word *leacht* seems to have been a general term applied to stone sepulchral monuments, consisting either of unfashioned stones of every size piled up over a simple grave, or over an "*Indeilb cloich*" or stone chamber, or of a number of large upright flags, upon which was placed a great block of stone." The latter kind of *leacht* is the monument popularly known as a "Cromlech." A simple flag marking a grave was called a *leac* or *liace* (plural *leaca*). When a number of persons were buried beside each other, their *leaca* were placed in a circle around the grave. Similar circles of *leaca* or upright flags were put around the *leachts*, formed of piles of stones. Pillar stones, or *cairti*, were also used to mark graves, and sometimes the name of the dead person was cut in *Ogam* upon them. The word *leacht* occurs frequently in topographical names, as, for instance, in *Tamleacht*, modernised in one case to *Tallaght*, a place near Dublin, but unchanged in *Tamlacht O'Crilly*, in the County of Londonderry. *Tamleacht* may be translated as the *leacht* of plague, and, so far as I know, consisted of several graves marked by a head and foot stone, or covered over by a *múr clocihe* or stone *múr*, and, where there were a number of them in the same place, surrounded by a circle of "*Leaca.*"*

* Manners and Customs of the Ancient Irish. Vol. I., page 331.

Near Coagh, County Derry, or about five miles east of Cookstown, there is a very fine cromlech, locally known as "The Tamlacht Stone"—*i.e.*, the plague stone. Here we have the ancient Irish name "*leacht*" popularly applied to a genuine cromlech. We may, therefore, reasonably accept the term "Cromlech" as a qualification of the generic Irish term "Leacht"—and expressive of their usual leaning or bending character, due probably in many cases to the fact that their original constructers were not able to obtain suitable supporters and in other cases, where such supports gave way with time. The qualification "crom" is, therefore, indicative of a bending with age, and is very significant.

What we require is a specific term applicable to the particular group of monuments we wish to describe, and expressive of their *present structural condition*, without involving any theory as to their original condition or object, and the term "Cromlech" meets these requirements fully.

The majority of our sepulchral monuments are more or less chambered, but they are separable into groups, each being very distinct in character. Our chambered tumuli are quite distinct from our kistvaens, and both differ so widely from our cromlechs that they could not be grouped under one head.

We have a capital example of the chambered tumulus crowning the hill of Carnanmore, East Torr, in the parish of Culfeightrin, County Antrim. This is the subject of our first illustration, which shows a distinct chamber formed of blocks of stones, roofed by large flags, and all closed or covered over by a great heap of small stones. There is scarcely a feature common to it and a Cromlech. See Sketch No. 1.

Farther south in the same county, on the high ground three and a half miles from Carnlough, on the road to Ballymena, we have the subject of our second illustration—Doonan Fort—an example of a tumulus and kistvaen totally unlike what is understood as a cromlech, and which could not be grouped under that head. See Sketch No. 2.

Certain chambers of kistvaens may occasionally be found that

very closely resemble cromlechs. As, for example, the kistvaen at Roughfort, in the parish of Templepatrick, which occurs about three and a half miles south of Doagh, and seven miles north of Belfast, and consists of a series of chambers forming a group forty feet long, the terminal chamber being very large, and covered by a great block of stone.

There are about thirty-eight stones in the group, and the block over the large chamber measures 6 ft. × 5½ ft. × 3½ ft., or equal to about eight tons.

If, in the course of time, this single chamber was left standing alone, it would have all the characters of a cromlech, and might be very fairly described under that head. See Sketch No. 3.

The author would define the term "Cromlech" as an ancient rude stone monument composed of one large block, supported by two or more stones, usually set on end or edge, forming a sub-ærial chamber.

Of such monuments the following include all those that occur in the Counties of Antrim and Down, and each of them has been personally examined by the author, and, as far as possible, measured and sketched.

CROMLECHS IN COUNTY ANTRIM.

The neighbourhood of Ballintoy, on the north coast of County Antrim, possesses many features of very great interest to the Irish archæologist, particularly the picturesque slopes of Whitepark Bay, to the west of the parish church. The long stretch of sand-dunes that skirt the base of the talus, below the mural cliffs of chalk surrounding the bay, formed the camping ground of early settlers. The evidence in proof of those ancient settlements is furnished by the quantities of stone implements, worked flints, chips and cores, charcoal and pottery, that have been collected here from time to time, and which, from their quantity and variety, indicate long periods of continuous occupation.*

* Journal of the Royal Historical and Archæolgoical Society. 4th Ser., Vol. V., July, 1879. Belfast Naturalists' Field Club Guide to Belfast, &c., 1873.

On the slopes of the higher hills, to the south of the public road above the bay, there are no less than three very fair cromlechs, as follows :—

1. MOUNT DRUID CROMLECH.

SKETCH No. 4.

This monument occupies a very commanding site on the hill-side above the rectory, from which the headlands of the Causeway cliffs can be seen. It is known as the "Druids' Altar," and consists of a large block about 6½ ft. long and 5½ ft. wide, supported on three of the four smaller stones forming the chamber.*

This monument comes within Sir John Lubbock's category of cromlechs, because it is enclosed by two circles of stones, one inside the other. The diameter of the outer circle is about 35 feet, and the stones composing it are about two feet high. Where stone circles occur in connexion with tumuli, they are on the outside. So small a circle as we have here is an indication that, at all events, this cromlech is not a mere chamber of an original tumulus, because a tumulus inside the circles could not very well cover the cromlech. The enclosing stone circle is an unusual feature in connexion with the cromlechs of the North-east of Ireland, and it is to be hoped that where they occur they may be preserved from further destruction. Sketch No. 4, and all the sketches illustrating this paper, have been taken on the spot by the author, who recommends that they should be compared with the respective monuments themselves, or with photographs of the monuments, rather than with such illustrations as are given in the statistical surveys for the Dublin Society, or in the "Dublin Penny Journal."

2. GLEGNAGH CROMLECH, BALLINTOY.

SKETCH No. 5.

This small but very perfect cromlech is in the townland of Glegnagh, near a quarry on the hill-side, south of the public

* Statistical Survey, County of Antrim, 1812—Part II., page 582. "Dublin Penny Journal." Vol. III., page 351.

road from Ballintoy to the Causeway, and about as far from the road to the south as Whitepark Bay cliffs are to the north side. The sketch is taken from the west side, looking towards the parish church. The islands off the west coast of Scotland can be seen from this monument. The author has found worked flints, flint flakes, and numerous chips of flint very near the cromlech. Stone celts have also been found in the immediate neighbourhood.

3. CLOGHNABOGHIL CROMLECH, BALLINTOY.

SKETCH No. 6.

This is the smallest cromlech in the North-east of Ireland. Its local name, Cloghnaboghil, signifies *the stone of the boy*. It is situated on the high ground in the townland of Lemnabeg, within half a mile to the west of Glegnagh Cromlech (2), and within sight from the public road. From the open and elevated position of this cromlech there is a very extended prospect seaward, including a considerable portion of the west coast and islands of Scotland.

4. CLOGHANUNCHER CROMLECH, BALLYCASTLE.

SKETCH No. 7.

This cromlech occurs on the heath-covered mountain, in the townland of Ballyvennaght, on the north side of the road from Ballycastle to Cushendun, and near what is known as "The Hungry House," being the house highest on the mountain in that direction. There are three bridges on the county road near "The Hungry House," and the cromlech is about a quarter of a mile from the centre bridge, in the direction of East Tor. The chamber, measuring about 5 ft. × 3½ ft., is formed of four upright stones, and is covered by a large stone 9 ft. long and 7ft. 6 in. wide, all the materials being of the Cambrian rocks of the district. There is a very good standing stone, gallaun or menhir, on a hillock near this cromlech, and it can be seen from the county road.

5. BALLYVENAGHT CROMLECH, BALLYCASTLE.

SKETCH No. 8.

This cromlech is about eighty yards north of No. 4. The sketch is taken looking south-west, and shows No. 4 Cromlech in the distance. The top stone measures 13 ft. 4 in. by 11 ft. 6 in., and is about three feet thick. The supporting stones have given way, and are crushed under the ponderous cap stone. The site is a swampy moorland, at the head of the valley of the Cary river. This and the last cromlech are almost overgrown with peat.

6. CLOGHS CROMLECH, CUSHENDALL.

SKETCH No. 9.

In the townland of Cloghs, to the west of Cushendall and about one and a half miles from the village, there is a cromlech with a chamber four feet long and three feet four inches wide, formed of six blocks of stone. The cap stone is turned over from its original position, otherwise the monument is in fair condition. There were other stone monuments in the vicinity, but they have been destroyed. A rude stone circle and avenue occurs on the mountain slope one mile west from the road to Cushendun. It is locally known as "Ossian's grave." The site commands an extensive prospect: from it the Scotch and Irish headlands can be seen, and is well worthy of a visit.

7. TICLOY CROMLECH.

SKETCH No. 10.

In the townland of Ticloy—*i.e.*, *The Stone House*—there are two cromlechs in the same field, the most perfect being the subject of our sketch. The second is shown in the background. The name of the townland is derived from this monument, which still retains the appearance of a stone house. It is well situated on Ticloy hill, above Ticloy water, about five miles to the west of Glenarm, and ten miles east by north of Ballymena. The land is cultivated all round the site, but the farming operations are carefully conducted, so as not to damage the monument in any way.

The gossip of the neighbourhood tells of a former occupier of the farm who had a dream, in which he was informed that there was some treasure buried beneath the cromlech. It is said he dug for many days, and at last found a crock, and that afterwards he became very wealthy, but refused to give any particulars as to his supposed treasure. Doubtless he did find a crock in the shape of a cinerary urn, and his disappointment at not finding gold prompted his reticence. The ruined condition of the second cromlech is, no doubt, the result of treasure-hunting, and to some extent corroborates the anecdote just related.

8. BROADSTONE CROMLECH, CRAIGS.

SKETCH No. 11.

On a heathy moor, in the townland of Craigs and parish of Finvoy, there is a very remarkable cromlech, known as "The Broadstone." It is about six and a half miles from Ballymoney in a southerly direction, or about one mile above the rectory of Finvoy. In former times this place was resorted to on Sundays and holidays for picnics, coursing, games, and pastime, and, doubtless, the consequent frolic and thoughtless mirth provoked on those occasions was the cause of the dilapidated condition of this monument at present. Happily there are very few who would wantonly or maliciously destroy our ancient monuments, yet the spirit that animated the ancient *Cuitech Fuait*, or funeral games, has expired long ago, and the object of their commemoration has been forgotten; therefore, the young folk of modern times, who entertain no profound veneration for ancient usages, think lightly of the injury their playfulness may occasion to ancient monuments, although they would not wilfully do them harm. The cromlech, as it now stands, is a restoration; the cap-stone, measuring 8 ft. 6 in. by 10 ft., and about 20 in. thick, was thrown down, but was re-erected on its three supporters, as at present, by the people in the neighbourhood. Adjoining the cromlech proper there are the remains of three or four circular chambers, and the group of stones

composing the cromlech and chambers is again surrounded by two concentric stone circles, the outer circle being about one hundred feet in diameter, and the inner fifty feet. Very little now remains to mark the outline of the circle. The sepulchral character of this very important monument is proved by the finding of cinerary urns in the round chambers.

9. FINVOY CROMLECH, CRAIGS.

SKETCH No. 12.

Although Broadstone cromlech has been frequently described, the subject of this sketch has been apparently overlooked; yet it is a very typical example, and occurs in a cultivated field close to the public road, within half-a-mile west of the Broadstone, and one mile east of the Presbyterian Church of Finvoy. The cap-stone is a flat slab, measuring 8 ft. long by 5 ft. 6 in. wide, over eight upright stones, forming a well-marked oval chamber, the major axis of which runs E.N.E. by W.S.W.

Formerly this monument was almost covered with earth, the cap stone alone being exposed. The earth was removed some years ago, and the monument now stands on the natural surface of the ground. During the excavation the chamber was explored, and a cinerary urn was discovered within.

10. CLOUGHOGAN CROMLECH, BALLYGILBERT.

SKETCH No. 13.

On the eastern slope of Ballygilbert hill, above the old road from Larne to Glenarm, there is a cromlech locally known as Cloughogan. It forms part of a boundary hedge near a farm cottage, and has done service for many years as a pigsty and poultry-house. For this purpose the open space between the uprights have been carefully filled in with small stones. The thrifty housewife who made this change, claims the credit of having built the house. Her worthy spouse, however, contends that the Danes built Cloughogan before the memory of man, and that she only built the byre. This cromlech is about eight miles north of Larne, or three and a half miles south of Glenarm,

on the slope of the hill to the west of the old road from Larne to Glenarm. There are many other antiquarian remains in the same locality, and worked flints are found scattered over the surface of the fields.

11. DRUIDS' COTTAGE CROMLECH, ISLANDMAGEE.

SKETCH No. 14.

The subject of this sketch may be found at the road-side, on the hill overlooking Larne Lough, from the northern extremity of Islandmagee, opposite the point of the Curran, and about one mile from the ferry. A cottage has been built adjoining the cromlech, so that the latter stands within a few yards of the front windows—a circumstance that has, doubtless, served to preserve the monument up to the present. The cap-stone, which is about six feet long, covers a chamber formed of blocks of stone standing on end, and together form a very fair example of our Irish cromlechs. The folk-lore of the locality refers to this monument when it had a far more imposing appearance, being in early times surrounded by other stones, possibly a complete circle. The building of the cottage and other *improvements* removed all trace of the circle, and the cromlech now stands alone. Early in the present century a number of gold ornaments were found in the immediate vicinity of the cromlech,* and worked flints may still be found on the surface of the sloping ground towards the lough.

12. FAIR HEAD CROMLECH, BALLYCASTLE.

Away to the east of Ballycastle, above the collieries, on the rocky plateau of Fair Head, there are the remains of a small cromlech. Within living memory this monument was complete, and the chamber was the favourite retreat of badgers. Here the country sportsmen came with their dogs to hunt, and the "sport" resulted in the overturning of the cap stone and the comparative destruction of the monument.

* See Dublin Penny Journal. Vol. I., 1832. Page 209.

13. CLOGHS CROMLECH, CUSHENDALL.

Within about a quarter of a mile from No. 6, and farther down the slope of the hill, there was once a very large cromlech. Many of the stones that composed the chamber may still be traced in the fences near the site; but the great cap stone and others were removed some years ago by an enterprising workman, who had them blown up by gunpowder to supply material for building the adjoining house; "*an by the same token*," says our informant, "*no good iver come if him.*"

14. MOYARGET CROMLECH.

This monument stood near the southern, or rather eastern, bank of the Invir, or Inver, Water, now a small stream separating the parish of Ramoan from the parish of Ballintoy. Like the last, very little of it now remains to indicate its former importance. Twenty-five years ago the standing blocks were known locally as the *grey stones*. There were originally about six supporting stones about five feet long, the cap stone being about eighteen feet long. The Rev. George Hill, a well-known archæologist, was one of a party who explored this cromlech in 1840. "A large urn of burnt clay was found about two feet below the surface, placed with the mouth downwards on a rude pavement, and contained a dark paste, evidently ashes made damp."

This monument may have originally marked the burial-place of a great northern chieftain named *Arghad*, from whom the two townlands of Upper and Lower Moyarget (Magh-Arghad) may have had their names.

15. TICLOY CROMLECH, No. 2.

This cromlech occurs in the same field as No. 7, and has been already sufficiently noticed. In sketch No. 10, the blocks of stone that composed the monument are shown at the foot of the tree in the background.

16. DRUMAGORGON CROMLECH.

Within about three miles from Antrim to the N.E., in the townland of Drumagorgon, there are the remains of a cromlech, locally known as "the giant's grave." The cap stone, about six feet long, has been overturned, and the monument otherwise dismantled, but not beyond the possibility of restoration. Tradition says that the adjoining hill to the east, known as "The Standard," was the scene of a great contest between two rival chiefs, and that one was killed and buried in this cromlech, together with his weapons of war. An enquiring antiquarian, early in this century, wishing to test the accuracy of this story, dug below the cromlech, and discovered such remains as satisfied him that a burial did take place here—a conclusion that was come to at the expense of the cromlech.

CROMLECHS IN COUNTY DOWN.

1. GIANT'S RING CROMLECH, DRUMBO.

SKETCH No. 1. PLATE XVI.

One of the most remarkable of the ancient monuments in the County Down is the well-known Giant's Ring at Drumbo, about three and a half miles to the west of Belfast. It consists of a circular rampart of earth, enclosing a space of about six hundred feet in diameter, or an area of eight acres. The earthwork is in a very fair state of preservation, owing to the judicious care of the owner, who had the rampart surrounded by a masonry wall, and otherwise well protected.

The height of the earthen rampart is sufficient to shut off a view of the surrounding landscape. In section it has a good broad base of about eighty feet, and slopes equally at both sides. The top, at present, is somewhat flat, a form which is apparently due more to weathering than to the original construction.

The cromlech stands almost in the centre of the enclosure; all the stones forming the chamber are *in situ*, but others are more or less disturbed, and seem to indicate that there was

originally an avenue leading to the chamber. In former times "the ring" was used as a race course, for which it was admirably suited, the rampart making a "grand stand." Under the circumstances, it must be a matter of congratulation that we have so much of the monument preserved. Excavations have been made in the vicinity of the enclosure, and several sepulchral remains have been found. A circular chamber was exposed about seven feet in diameter, formed of blocks of stones covered over with flags. Minor internal divisions of the main chambers contained four cinerary urns and other evidence of ancient burials. Within a short distance of this chamber several other cists of sepulchral character were discovered, all indicating the importance of the central monument in ancient times.*

2. KEMPE STONE CROMLECH, DUNDONALD.

SKETCH No. 2.

The megalithic monument, locally known as the Kempe Stone, is one of the most important in County Down. It occurs on the high ground about a mile to the west of the village of Dundonald, and not far from the main county road from Belfast to Newtownards. The group of stones composing the monument occupy a space of 12 ft. by 8 ft., and stand ten feet high to the east and six feet to the west. The chamber measures five feet long, five feet wide at east end, and three feet wide at the west. This chamber is formed of six blocks of stone; the eastern blocks are upright, and the side blocks are on edge, eight, and seven feet long respectively; the cap stone measuring eight feet six inches long, seven feet wide, and on an average three feet six inches thick. The block must weigh about seventeen tons. The top of the cap stone has a quick fall or slope to the west. This feature, so common to our cromlechs, may in this case be due to original construction, as the stones supporting it at the west are smaller than those at the east end, and the cap itself is thinnest at the west end. The present name of the townland is Greengraves. The locality was formerly denominated *Bally-clogh-togle* (town of the raised or lifted

* Ulster Journal of Archæology. Vol. III., page 357.

stone). Local tradition states that a stranger warrior has been buried there. Apart from the monument itself, there are scattered all round the vicinity large blocks of stone. Many of them are now built into, or form parts of the boundary hedge. Their distribution and character indicate that they are the remains of some dismantled megalithic monument of very considerable importance.

3. MOUNT STEWART CROMLECH.

SKETCH No. 3.

Within the demesne of Mount Stewart, in the parish of Greyabbey, about five miles from the town of Newtownards, there is a small cromlech-like monument, the remains of a very remarkable cemetery that once existed here. It consisted of a cairn of small stones about thirty feet in diameter and five feet high, and constituted what might be denominated a chambered tumulus.* In 1786 the then owner of the estate considered it desirable to drain the field, and the work was undertaken, calculating upon the advantage of having so large a supply of suitable material for filling up the drains. As the workmen employed removed the stones from the cairn, or tumulus, they exposed on the southern portion of the heap a number of cists or stone chambers (between sixty and seventy), formed of stones on edge, and covered by flags. In the north-west corner of most of the chambers there was deposited a cinerary urn, many of them being quite perfect and elaborately decorated with the usual incised patterns, specimens of which are to be seen in private collections, and in the Belfast Natural History Museum. The central chamber was very much larger than the surrounding cists, and constitutes the subject of our sketch. At the side of the cromlech one of the smaller cists, or sepulchral chambers, is preserved. A full description of the exploration of this monument is given in a pamphlet, entitled "An Historical Essay on the Parish and Congregation of Grey-abbey," by Dr. S. M. Stephenson, published in Belfast in 1828.

* See Ulster Journal of Archæology.

4. LOUGHMONEY CROMLECH.

SKETCH No. 4.

The parish of Saul, so closely identified with the life and labours of St. Patrick, is rich in antiquarian remains, of which the cromlech of Loughmoney is one of the most interesting. It is in a good state of preservation, and stands in a field close to the public road, a few miles east of Downpatrick. The cap stone measures nine feet six inches by five feet three inches, supported by only two stones on edge, each seven feet by three feet, forming a chamber about two feet ten inches wide, and at present open at both ends.

5. LOUGHANISLAND CROMLECH.

SKETCH No. 5.

On the north shore of Loughanisland lake, four miles south of Crossgar and four miles west by north of Downpatrick, near the Buck's Head Tavern, in the townland of Annadorn, there is a cromlech having a well-defined chamber of four large blocks of stone, with a cap stone measuring eight feet by seven feet. The latter has been turned over a little from its normal position. Some years ago a utilitarian wanting building materials set about demolishing this cromlech by a powder blast. A splinter of rock fell on and damaged the roof of his dwelling-house—an incident he took to be an omen of bad luck, and quietly gave up the undertaking.

6. SLIDDERY-FORD CROMLECH.

SKETCH No. 6.

Within a mile of Dundrum, at Sliddery-Ford, on the Newcastle road, in the townland of Wateresk, there is a very perfect cromlech. The cap stone, a granite block, measures seven feet six inches by seven feet six inches, or nineteen feet six inches in girth, covers a chamber formed of three blocks of stone, one being six feet high. In Dubourdieu's statistical survey of County Down, page 271, he describes a circle of twelve standing stones near this cromlech. At present there are but two in the

locality, at the side of a lane, a little to the south of the cromlech, one of the stones being eleven feet high. The field in which the cromlech stands also contains a souterrain or underground dwelling, and the view from the cromlech overlooks the sand-dunes of Dundrum, which have yielded such a number of worked flints, stone implements, pottery, and other evidences of ancient settlements.*

7. CLOUGHMORE CROMLECH, GOWARD.

SKETCH No. 7.

The cromlech known as Cloughmore, on the mountain side, in the parish of Clonduff and townland of Goward, is one of the largest and best in the county. It is accessible from Hill-town or Rathfriland, being two miles from the former and five from the latter. It consists of a massive cap stone of granite, thirteen feet long, ten feet wide, and five feet thick, weighing probably fifty tons, supported by a group of nine other stones forming several chambers, the principal chamber being nine feet long and three feet six inches wide. One of the front uprights is very slender, and stands seven feet high, the complete monument being fully fourteen feet high. Local authorities state that formerly this cromlech was enclosed by a circle of stone blocks or standing stones. They have been long since removed, and there is no trace of them existing at present. Excavations have been made below the cromlech, and cinerary urns, with other evidence of sepulture, were found within the main chamber. At present the site is protected by a planting of fir trees, and the tenant of the adjoining cottage is the honorary caretaker of the cromlech.

8. LEGANANNY CROMLECH, DRUMGOOLAND.

SKETCH No. 8.

On the craggy southern slopes of Cratlieve mountain, in the parish of Drumgooland and townland of Legananny, the subject of this sketch stands on an exposed site, commanding an exten-

* Journal of Royal Historical and Archæological Society of Ireland. Fourth Series, Vol. V.

sive prospect to the south and west. The cap stone is shaped like a coffin, fixed north and south, eleven feet four inches long, four feet nine inches wide at the shoulder, and three feet wide at the foot or north end, in which direction it has a slope clearly due to its original construction. It is supported on three upright blocks—two at the south end measuring seven feet and six feet two inches respectively, while the upright at the north end is only four feet five inches high. This upright has been fixed on a bank as if to increase its height, and as all stand now on the bare surface, this northern prop is very unstable, and should be secured. Some years ago an urn was found in the open chamber below the cromlech. Mr. Ferguson, in his work on rude stone monuments,* gives a figure of this cromlech from a drawing by Sir Henry James, of the Ordnance Survey, and refers to it in his argument combating Mr. Lukis' idea that all cromlechs were originally chambered tumuli.

9. KILKEEL CROMLECH.

SKETCH No. 9.

Within a half mile of Kilkeel, in the south of Down, off the road to Newcastle, there occurs a megalithic monument known as the "Crawtee Stone," probably from the Irish word *cruit*, meaning hump, which expresses very clearly the shape of the cap stone of granite, nine feet long and eight feet six inches wide, that covers the chamber beneath, measuring about five feet six inches square, and formed of four water-worn boulders of granite, such as were, doubtless, common in this district in pre-historic times. The sketch is taken looking towards the Mourne Mountains. Some years ago, the promoters of some local building speculation debated the advisability of destroying the monument for the materials it would afford. After due deliberation they fortunately abandoned the project, not moved by the laudable desire to preserve our ancient monuments, but they yielded to the dread of unlucky consequences. A similar dread prevents timid folk passing this cromlech alone after dark.

* Rude Stone Monuments of all Countries. By J. Ferguson, D.C.L., F.R.S. London, 1872. Page 45.

10. CAUSEWAY WATER CROMLECH.

SKETCH No. 10.

The Causeway Water is a mountain stream that runs south-west along the eastern boundary of the townland of Kilfeaghan, and crosses the public road from Warrenpoint to Kilkeel, four miles from the latter place. To the west of the river, on the slope of Kurckshee, there is an excellent cromlech on a site that overlooks Carlingford Lough. A block of rounded granite ten feet long, eight feet wide, and five feet thick, weighing probably 30 tons, forms the cap stone over a chamber composed of several granite blocks on end. The site has become a rubbish-heap for ages, and all the loose field stones and other impediments to farming operations have been collected around the cromlech so far as to almost hinder the goats from taking shelter in the chamber as they were wont to do. To the east of the cromlech, and close to the bank of the river, there is another megalithic structure, more like a kistvaen, and the site around has yielded several examples of stone implements.

11. SLIEVENAGRIDDEL CROMLECH.

On the topmost peak of Slievnagriddel Mountain, within a few miles to the east of Downpatrick, there are the prostrate remains of a once standing cromlech. The blocks that composed it are now resting on the bare rock. The cap stone measures eight feet by six feet, and below it are two slabs that formed the sides of the original chamber. It is said that this cromlech was thrown down by the officials of the Ordnance Survey.

12. SAMSON'S STONE CROMLECH.

Near Downpatrick, to the south of the town, there is a large transported block known as Samson's Stone. This may be the remains of a cromlech such Mr. Du Noyer describes as "earth-fast."* The Rev. J. O'Laverty, M.R.I.A., refers to this as a "ruined cromlech." See his work on Down and Connor. Vol. 1., page 252.

* Kilkenny Archæological Society. Vol. V. New Series.

13. DROMORE CROMLECH. (?)

Taken down many years ago to supply stones for a rockery in the Palace Garden.

14. DRUMGREEN CROMLECH. (?)

Forty years ago there was a cromlech in the townland of Drumgreen, on the road from Newry to Rathfriland. A large cap stone stood on three supporters. All have been removed to make building materials and road metal.

The above list, in the opinion of the author, contains all the known cromlechs of Antrim and Down. If found imperfect, the author will be glad to receive any correction from friendly critics; and such corrections, together with any assistance rendered towards compiling a schedule of the ancient monuments of the North of Ireland, will be gratefully acknowledged.

NOTE.—This mark (?) is placed after all the cromlechs that cannot be vouched for upon the author's personal observation.

COUNTY ANTRIM.

CHAMBERED TUMULUS, CARNANMORE.

1

DOONAN FORT, TUMULUS AND KISTVEAN.

2

COUNTY ANTRIM.

KISTVEAN, ROUGHFORT.

3

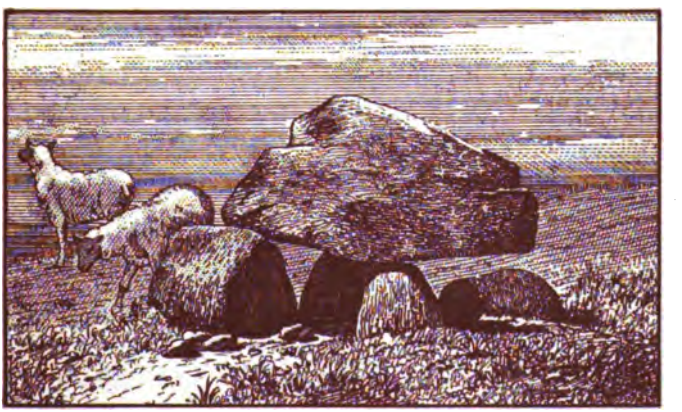
MOUNT DRUID CROMLECH, BALLINTOY.

4

COUNTY ANTRIM.

GLEGNAGH CROMLECH, BALLINTOY.

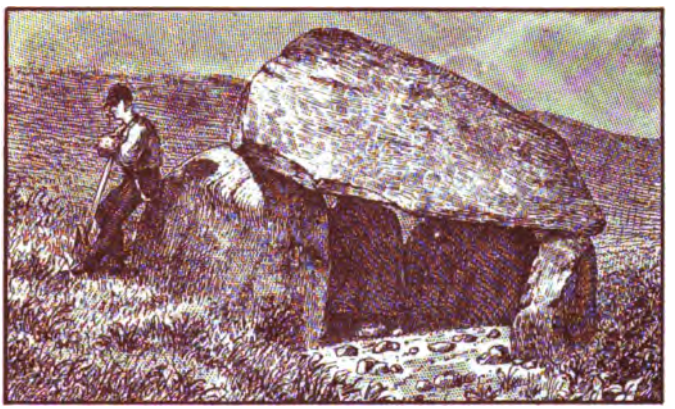
5



CLOUGHNABOGHIL CROMLECH, BALLINTOY.

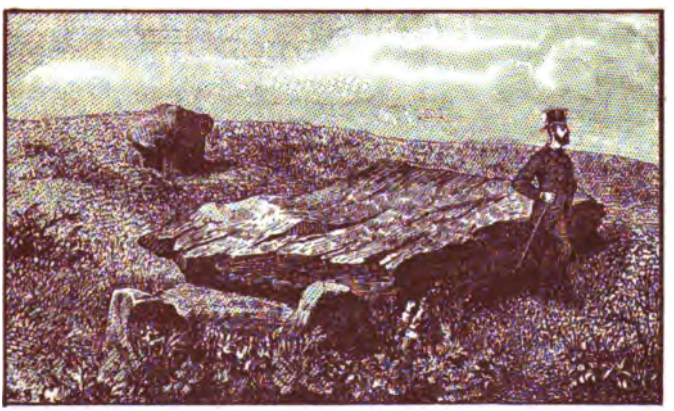
6

COUNTY ANTRIM.



CLOUGHANUNCHER CROMLECH, BALLYCASTLE.

7



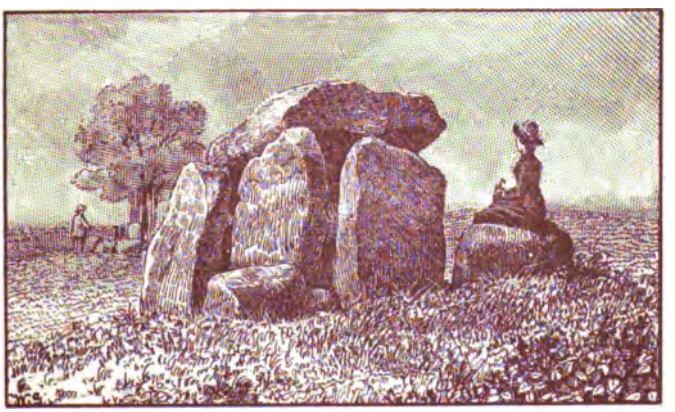
BALLYVENNAGHT CROMLECH, BALLYCASTLE.

8

COUNTY ANTRIM.

CLOGHS CROMLECH, CUSHENDALL.

9



TICLOY CROMLECH.

10

COUNTY ANTRIM.

BROADSTONE CROMLECH, CRAIGS.

11

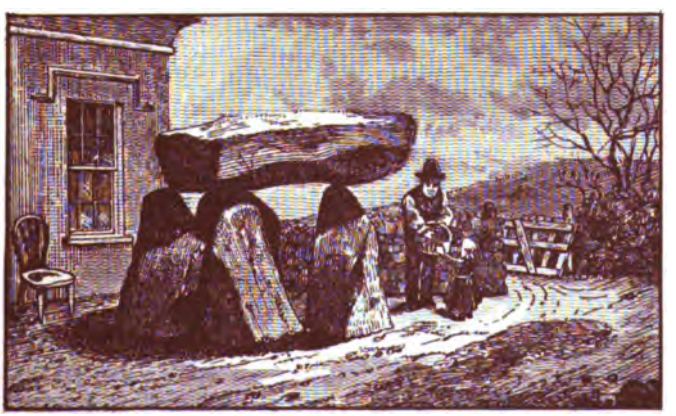
FINVOY CROMLECH, CRAIGS.

12

COUNTY ANTRIM.

CLOUGHOGAN CROMLECH, BALLYGILBERT.

13



DRUIDS' COTTAGE CROMLECH, ISLAND-MAGEE.

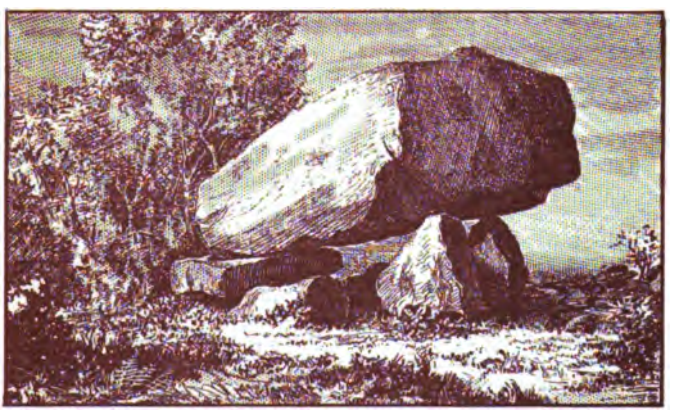
14

PLATE XVI.

COUNTY DOWN.

GIANTS' RING CROMLECH, DRUMBO.

1



KEMPE STONE CROMLECH, DUNDONALD.

2

COUNTY DOWN.

MOUNTSTEWART CROMLECH.

3

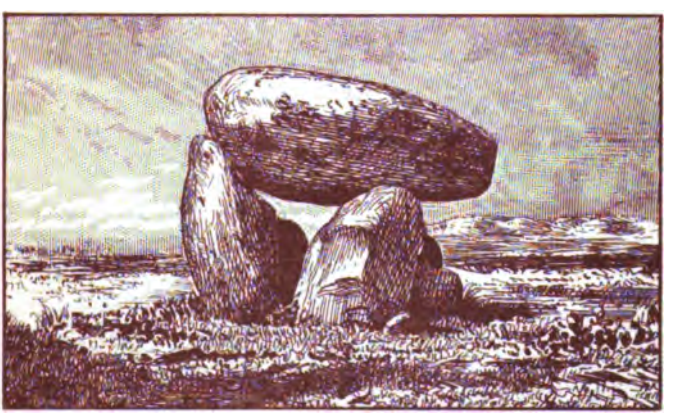
LOUGHMONEY CROMLECH.

4

COUNTY DOWN.

LOUGHANISLAND CROMLECH.

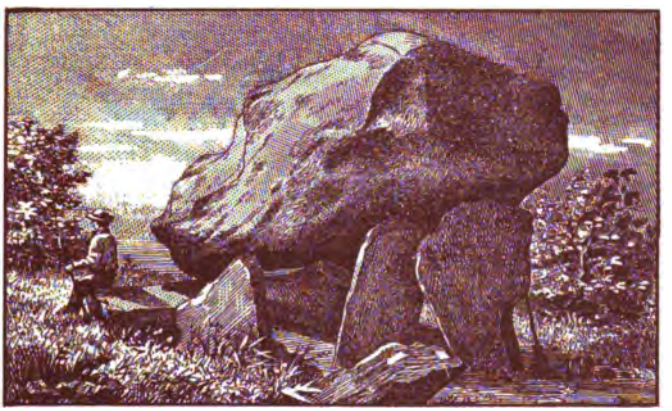
5



SLIDDERYFORD CROMLECH, DUNDRUM.

6

COUNTY DOWN.



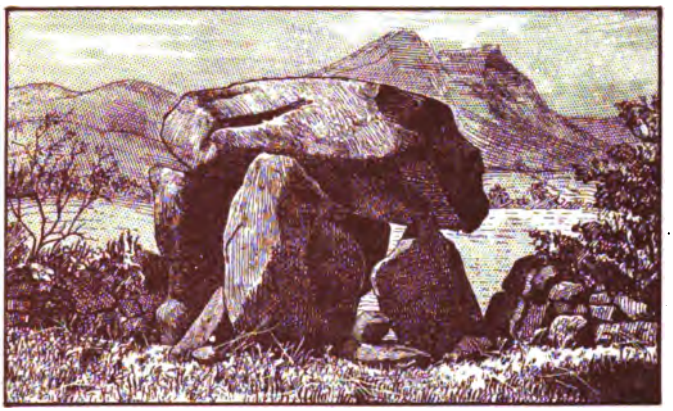
CLOUGHMORE CROMLECH, GOWARD.

7

LEGANANNY CROMLECH

8

COUNTY DOWN.



KILKEEL CROMLECH.

9

CAUSEWAY WATER CROMLECH, KILFEAGHAN.

10

(*Proceedings Belfast Naturalists' Field Club.—Appendix* 1883-1884.)

NOTES ON THE

PRE-HISTORIC MONUMENTS AT CARROWMORE,

NEAR SLIGO:

BATTLE-FIELD OF THE NORTHERN MOYTURA.

BY CHARLES ELCOCK.

ABOUT two and a half miles south-west of Sligo, the high road to Seafield passes through Carrowmore, in the parish of Kilmacowen. It lies at the foot of Knocknarea, on the summit of which, at an elevation of 1078 feet above the sea, stands the large tumulus of the celebrated Queen Meave, which has served for many a century as a mark for mariners far out at sea. Carrowmore is slightly elevated above the surrounding country, and the surface is considerably undulating. The whole district, and for many miles in a line nearly north and south, inclining a little to the north-west and south-east, is covered with large, irregular, erratic blocks of coarse granite, dropped during the glacial period.

Carrowmore may be regarded as classic ground, and the antiquarian may here revel for days in examining the various rude stone monuments, such as cromleacs, cists, stone circles, tumuli,

cahirs, and forts which abound upon it. It is the site of the last and desperate battle fought by the Firbolgs,* about the year 30 B.C., just before they fled to Aranmor, where several of their stone cahirs still remain. At Carrowmore they made their last stand on the mainland of Ireland. The name of the Northen Moytura is given to the battle there fought, so as to distinguish it from a previous hardly-contested battle, fought about seven years earlier, on the plain of the Southern Moytura, close to Cong, at the north end of Lough Corrib. The monuments on the latter battle-field, though of a very different character to those at Carrowmore, are equally remarkable and interesting to the antiquary, and form a lasting memento of the fierceness of the struggle which, occupying several days, there took place. They are well described in Wilde's "Lough Corrib," the account being, perhaps, rather too florid for exactness.

The monuments on Carrowmore, of which, in 1883, sixty-three could be identified, are clustered together within a roughly oval space of about three-quarters of a mile long by less than half a mile wide. Near the centre of this is a large mound, of which the proper or original name is supposed to be lost. It is now called Listoghil, which I was told on the spot, means rye-fort. But some little investigation kindly undertaken by my friend M. J. Ward, leads him to the conclusion that its derivation is from "lis"=fort, and "toghuil"=overthrow,—the Fort of Overthrow,—which possibly may be the "real, original" name, given to mark the spot of the decisive struggle.

Listoghil is a large heap of small stones, and for many years served as a quarry for road metal. However, one day when the workmen were carting the stones away, they came upon a huge flat stone resting on several others, "like a table," and fear at once stopped any further destruction. It was evident that Listoghil was not a mere mound, but was one of the ancient

* For an examination of the question as to whether there *was a second* battle of Moytura fought—which some query—see Jubainville's "*Cycle Mythologique Irlandais*," where the whole matter, with many references, is largely gone into.

monuments of which so many lie scattered around it. In 1837 the fort (as it is called) was about one hundred and fifty feet in diameter; in 1883 it is about one hundred and twenty; originally, it was probably about fifty feet high. Two stone circles formerly surrounded Listoghil, the outer circle consisting of one hundred and fifty stones. Some of these are still standing. From the top I counted twenty-two stone circles in sight, and six cromleacs, besides the one under my feet.

The large stone, "like a table," which had become exposed, is the cap stone of a large cist, or cromleac. It is a flat lime-stone flag, about nine feet six inches square by one foot six inches thick. The height of the supporting stones I could not determine without excavation, which could not be undertaken. The interior of the cist or chamber is considerably filled up with boulders, which have been thrown in at the entrance to please the rustics by "the thundering noise they make." The cist was opened "some years ago" by "some distinguished man," whose name I could not learn. He brought two men with him, and they dug down inside the chamber, and found "burnt human bones, charred wood, and a large stone spear-head," which were carried off. All trace of them is now lost. I was told by the farmer, in whose fields most of these monuments stand, that burnt bones, "like horses' bones," are still found at Listoghil when a fall of the loose stones occurs.

Entrance to the cist cannot now be had without removing the stones lying about. By lying down I got my head inside, and thought I could detect some rudely incised circles on some of the stones, one circle being about ten inches in diameter. These need further investigation. Dr. Petrie's* number for Listoghil is 51.

* Dr. Petrie visited and afterwards described the Carrowmore monuments, and gave numbers to each, so as to identify them afterwards. I have made use of these; but the route he took in going over the field is very difficult to follow so exactly as to be sure we are correct, and I am not certain whether, in some instances, I may not have mistaken his number. His letter on Carrowmore is dated "12. 8. 1837." See his Life.

Walking from Sligo, the first cromleac which meets the eye is one close on the left or east side of the road. It formerly had a stone circle round it, which was cut through when making the road, and several of the stones were broken up to make the wall. Some may be seen in the wall, and one is still in the field, *in situ*. The cap stone very much resembles the top of a mushroom. It measures about twenty feet in circumference, and stands on six stones. One feature of this cromleac arrests the attention almost at the first glance. On the western side it has a sort of projecting porch-like entrance, formed by four stones—a peculiarity which is found on other cromleacs on Carrowmore. Dr. Petrie calls this No. 13. See sketch No. 1.

On the west side of the road, and almost opposite the cromleac just mentioned, is a short lane leading to a field, near the highest part of which, but not visible from the main road, stands the largest of all the Carrowmore cromleacs. Its Irish name is "Leaba na Ffian," which means the bed or grave of the warrior—a name which is given to each of the cromleacs in this group. The proverb as to the healing power of time could scarcely meet with stronger proof than that given by this Pagan monument, for the *cause* of the erection of this cromleac is now so completely forgotten in the neighbourhood, that that which is the result of bitter hatred is now known commonly as "The Kissing Stone." Swains and maidens know the reason why.

This cromleac is perfect, and stands from eight to nine feet high. The cap stone rests on three of the six stones under it, and measures about twenty-three feet in circumference, being about ten feet long. A stone circle, nearly forty feet in diameter, still surrounds the cromleac, thirty-two stones being *in situ*. The porch-like entrance is here seen also. This is the only cromleac of the group into which we can walk. Dr. Petrie calls this No. 7. See sketch No. 2.

Almost due south of this cromleac, and being but a few yards

away, easily seen from it, stands Dr. Petrie's No. 4. This cromleac is quite perfect, and stands about five feet high. There are five supports for the cap stone, which measures about fourteen feet in circumference. It stands near the middle of a field, and formerly had a stone circle around it about forty feet in diameter, consisting of forty large stones. When Dr. Petrie visited it in 1837, he found twenty-one of these still there. In 1883 these were all gone but one! On enquiring of the farmer before-mentioned how this was, he told me the twenty-one stones were all there still, but twenty had been buried by the man who held the farm before him, adding—"And he got no good by burying them." The former tenant feared to destroy the stones, and so dug a large hole at the base of each, and then tipped twenty of them into the holes made, "and there they are still," said my informant. He would have tipped over the last stone, but the agent, hearing what he was doing, came and stopped him just in time to save it. On account of the stones being "still there," though invisible, I have ventured to name this "The Cromleac of the Phantom Stones." Although there are no stones placed as a porch outside the supporting stones, yet the idea of having a special entrance is evident in the construction of the entrance. See sketch No. 3.

The remains of at least two very fine circles are near this cromleac, one of them containing a ruined cromleac, and the other having been a double circle, the outer circle being formed of very large stones. The chamber of the ruined cromleac was examined about fifty years ago by a gentleman named Walker, who found human remains in it. About a dozen were thus examined, and at least ten of them contained an interment of human remains, and in one instance the cromleac contained an urn, broken. This was found in Dr. Petrie's No. 17—a double circle.

Crossing the road again, there stands a little way south-west of the farm-house a large heap of stones which have been gathered off the land. Under this heap there is a perfect

cromleac. It was covered when Dr. Petrie visited it. His number for it is 55. This ought to be uncovered by the Board of Works, under whose care these monuments are now placed.

Not far from this heap, down in the hollow near the house, stands Dr. Petrie's No. 53. Nothing but the cromleac is now left, the circle formerly around it having disappeared through "improvements" many years ago. The cromleac stands very low, and will soon be gone from sight, as it forms a good basis for a stone-heap, such as that at No. 55. It scarcely reached higher than the top of the oats by which it was surrounded when I saw it. See sketch No. 4.

In the next field to the south are a great number of circles; one in the east corner is formed of very large stones, and near it on the south-west is a fine large "giant's grave," or stone cist. Half of Listoghil stands in the field, and two cromleacs also.

The nearest to us is Dr. Petrie's No. 52. It is a large cromleac, with a conical cap stone, flat underneath. Query, was it a double cromleac? The porch-like entrance is very marked, unless what looks like a porch may be the supports of a second cromleac, of which the cap stone is gone. A circle formerly surrounded this cromleac, but only one stone is now standing, and this is not in its original place. My informant once saw this stone being moved away, and he put it back as near as he could. There is a gentle incline of earth and stones up to the top of the supports of the cap stone, looking like an inclined plane, up which the cap stone was pushed into position, but I do not think it was formed for that purpose, though I could not learn whether it had been formed by throwing the stones there which were cleared out of the land. See sketch No. 5.

Passing by Listoghil on our left, we see below us on the south, Dr. Petrie's No. 48. This cromleac is perfect, the cap stone being about six feet square, but is nearly level with the ground. At a distance of thirty-eight feet from it stands a

large solitary pointed stone, five feet high, the only one left of what must have been a magnificent circle, about eighty feet in diameter. See sketch No. 6.

Double circles, with ruined cromleacs, are seen west of this in the same field.

Near the pond, at the bottom of the hollow, there is what appears to be a cist of unusual construction. There is a very large flag-like stone, flush with the surface, under which is a hollow space. I pushed my umbrella into it, through an opening on one side, and could swing it about. It was too dark inside to see anything. The peculiar feature is this:—On the *top* of the flag, and placed round it, resting partly on the flag and partly on the surrounding soil, are a number of large stones, as if put there to keep the flag down and prevent its being raised. What can this be? I have never seen any similar structure.

Just over the wall, in the field at the top of the hill, is seen a very remarkable cashel or fort. It may be called roughly square, the sides being about one hundred and twenty feet long. The circumscribing walls are perhaps ten feet thick, and are made up of earth and massive stones. There are two entrances on opposite sides, north and south. The interior is divided by cross walls at right angles, and there appears to have been a cist or structure of some sort in it. There are a ditch and bank outside the wall. Altogether, it is very difficult to say what this really was, its appearance being so very different to what is usually found in forts, &c., and excavation would be necessary to settle the question whether this was a place of sepulture or not. Can it have been the great Firbolg stronghold? Dr. Petrie numbers it 46.

Leaving the cashel and passing to the east, in the direction of Cloverhill, keeping near the wall, we soon come upon the last of the perfect cromleacs left on Carrowmore. It is Dr. Petrie's No. 37. It stands in the centre of a triple series of circles still there. The cromleac is small, the cap stone being about sixteen feet in circumference, and resting on five stones.

The porch is very striking. The smallest circle is forty feet in diameter, and consists of small stones, much covered by the grass, so as to be nearly hidden. The middle circle is eighty feet in diameter, and is formed of twelve large stones. The outermost circle is one hundred and twenty feet in diameter, and is composed of twelve much larger stones, some of which have been displaced. See sketch No. 7.

This list mentions all the cromleacs which are perfect in 1883. Ruins and traces of others, with single, double, and even triple chambers in them, are numerous, no less than twenty being traceable, though many more formerly stood on Carrowmore.

There is one very fine circle not far from No. 37, some of the stones of which stand seven feet above ground. Three or four have slipped from their places owing to the carting away of the gravel from the mound on which the circle stands. There are traces of cists or cromleacs within this circle, and on stamping the ground, it sounds as if hollow. Originally "over fifty" stones stood round the edge of this circle, which is seventy to eighty feet in diameter.

In a field about three hundred yards east of this circle, and on the left of the road to Cloverhill, is a stone cist. The tops of the stones are level with the ground. Some of the stones are carved with very rude scribings, and one at the entrance has on the edge what looks very much like an Ogham inscription. The drawings of these sculptures in Ferguson's "Rude Stone Monuments" are not correct.

At the extreme northern end of the battle-field is still to be seen the well of very fine water, never known to be dry, at which the Firbolgs are said to have drunk on the day of the battle. Its Irish name is "Tober na Ffian,"—the Warrior's Well.

A very short distance north of the Well stands a very remarkable solitary stone. It is called "Cloch-breac," The Grey [or Speckled] Stone. It is a flagstone standing on

edge, measuring nearly ten feet above ground, and as wide as high: its thickness is about seven inches. It has a large quadrangular hole cut through it, large enough for a man to creep through with ease. It forms a "mearing point" for the three adjoining parishes. Why it was erected, or when, is quite lost, and I could learn no tradition respecting it. Is it one of the old Pagan oath stones, such as the Maen-an-Thol, in Cornwall, or as "The Long Stone" at Minchinhampton, in Gloucestershire? Besides being used for swearing, such stones were used for curing children who had the measles, whooping-cough, &c., by passing the child through the hole! A superstition which it is hoped is now quite gone.

There is yet one more of the antiquities in Carrowmore which must be mentioned, although properly speaking not exactly belonging to the Moytura monuments. This is The Caltragh, a large Pagan burying ground, about a quarter of a mile due east of Cromleac No. 13. It may be seen from the field in which this cromleac stands, and from Listoghil. The Caltragh is an irregularly circular mound, about one hundred and fifty yards in diameter, enclosed by a wall. Some slight excavations made here and there many years ago, showed it to be full of human bones. The examination was difficult, owing to the prejudices of the neighbourhood. No burial has ever taken place there within the reach of tradition, and the ground is regarded as under a sort of *taboo*. Undoubtedly it dates from a very remote antiquity—probably much older than the Carrowmore monuments.

The whole of these monuments are included in the Act for the Preservation of Ancient Monuments.

There is now little doubt that the stone enclosures known as Druidical Circles, Druid's Altars, and such like, are invariably sepulchral, with which the Druids had no sort of connection as to worship. The stone circles in all probability mark the burial places of the common soldiers who fell in the battle, and the cromleac in the centre, the grave of the chieftain—the

"great man" who commanded them. Almost invariably, wherever examined, traces of human interments have been found in both. This is borne out by the ancient Irish name for all the Carrowmore monuments—the graves or beds of the warriors.

Such of our members who may be in Sligo may count on a day of exceeding interest and instruction by paying a visit to Carrowmore. Out of Brittany, there is no other collection of such antiquities known to equal it in the world.

Works of reference in connection with the subject :—

Ferguson's Rude Stone Monuments.
Dr. Petrie's Life and Letters.
The Book of Fenagh.
Dunraven's Notes on Early Irish Architecture.
Jubainville's Le Cycle Mythologique Irlandais, chaps. vii., viii.
Wilde's Lough Corrib.
Wood-Martin's History of Sligo.—This book contains the most recent information about Carrowmore.

CHARLES ELCOCK.

CARROWMORE, CO. SLIGO.

CROMLECH, *Dr. Petrie's, No.* 13.

1

THE KISSING-STONE, *Dr. Petrie's, No.* 7.

2

APPENDIX IX.

*****

I. RECENT OSTRACODA OF BELFAST LOUGH.

BY SAMUEL M. MALCOMSON, M.D.

II. THE FUNGI OF THE NORTH OF IRELAND.

BY HENRY WILLIAM LETT, M.A., Trin. Coll., Dublin.

III. FORAMINIFERA

OF THE BELFAST NATURALISTS' FIELD CLUB'S CRUISE OFF BELFAST LOUGH IN THE STEAM-TUG "PROTECTOR," JUNE, 1885; ALSO, FORAMINIFERA FOUND BY DR. MALCOMSON, AT ROCKPORT, BELFAST LOUGH.

BY JOSEPH WRIGHT, F.G.S.

IV. A LIST OF THE CRETACEOUS FORAMINIFERA

OF KEADY HILL, COUNTY DERRY.

BY JOSEPH WRIGHT, F.G.S.

V. A LIST OF IRISH COLEOPTERA,

BY ROBERT PATTERSON, F.R.S.

EDITED BY S. A. STEWART, F.B.S., Edin.

PUBLISHED BY

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RECENT OSTRACODA OF BELFAST LOUGH.

By SAMUEL M. MALCOMSON, M.D.

As very few Ostracoda have been recorded from the North of Ireland, and as no systematic list of the species inhabiting Belfast Lough and its neighbourhood has ever been made out, I determined some years ago to examine all the material containing them which I could obtain, with a view to supplying this deficiency.

When I mentioned my project to Mr. Joseph Wright, F.G.S., he very kindly offered to place at my disposal all the material dredged by himself and Mr. Wm. Swanston, F.G.S., from the examination of which he had compiled the extensive list of Foraminifera published in an appendix to the proceedings of the Belfast Naturalists' Field Club for 1876-77. To these valuable dredgings I have added one gathering of my own, consisting of shore sand from Rockport, County Down, and also the dredgings taken at the Field Club excursion in the steam tug "Protector," in 1885.

Want of time has prevented the examination of Mr. Wright's entire series of dredgings, but those already done seem to give a fairly representative list of the Belfast Lough species, and as Strangford Lough has not yet been systematically dredged, I have considered it better not to incorporate the gatherings from that locality in the present list.

Altogether, gatherings from twenty-one stations have been examined. Eleven of these situated in the Irish Channel, just outside the mouth of Belfast Lough, were all, except three, in moderately deep water (30 to 72 fathoms).

Five of the stations were in Belfast Lough itself, and all in shallow water (4 to 10 fathoms), while the remaining five stations were situated on the beach, and consisted of shore gatherings, taken from the surface of the sand or from rocky pools between tide marks.

These gatherings altogether have yielded 100 species of marine Ostracoda,

as well as five fresh water species,* which were found in the shore gatherings, but these had evidently been carried down by streams, and consequently have not been included in the present paper.

Two tables are appended—one giving particulars of depth, locality, nature of sea bottom, quantity of material examined, and number of species found in each gathering; and the other showing the distribution and comparative rarity of each species.

I am very deeply indebted to G. S. Brady, M.D., F.L.S., for the great assistance he has rendered me in the identification of many doubtful specimens, and for the valuable information he has given me about some of the more interesting species.

I must also thank my friend, Mr. Joseph Wright, for his kindness in placing his gatherings in my hands, and Mr. David Robertson, F.G.S., of Glasgow, for his help in determining some of the critical species.

The following species deserve special notice :—

Paracypris polita, *G. O. Sars.* Only two or three single valves of this species were found, all of them in one locality—viz., Brown's Bay, Islandmagee, one of the excellent shore gatherings collected for Mr. Wright's paper by Mr. Gray, M.R.I.A.

Bairdia inflata, *Norman.* This species seems to be fairly common in the Irish Channel, but only one valve was found in Belfast Lough, and that one at White Head, which is almost at the mouth of the Lough.

Bairdia obtusata, *G. O. Sars.* Only two specimens of this very rare species were found, both in the "Protector" dredgings.

Cythere cribrosa, *B. C. and R.* I have only seen one specimen of this species. It has not been previously found in the recent state, but occurs fossil in the Post-tertiary deposit at Bridlington, Yorkshire.[1]

Cythere Cluthæ, *B. C. and R.* Although rare, this species seems to be generally distributed in the deeper water. Recent specimens have not been previously recorded, but fossil ones occur in several post-tertiary deposits.[2]

Cythere Dunelmensis, *Norman.* This species seems to inhabit only a very limited area in Belfast Lough, as it has been found in only two gatherings, taken from stations which were close together—viz., off Rockport, 4 fathoms, and Rockport shore sand. It is usually found in much deeper water, and is not a littoral species. I think it is probable that the shore sand specimens have been washed up by some current,

* Potamocypris fulva, *Brady*; Cypris tumefacta, *B. and R.*; Cypridopsis villosa (*Jurine*). Candona albicans, *Brady*, and Candona compressa (*Koch*).

(1.) See Post. Tert. Entom. Scotland, p. 146.

(2.) See Post. Tert. Entom. Scotland, p. 153.

although they do not appear much worn; but as several other species of Ostracoda, as well as Foraminifera, which usually inhabit deeper water, have been found in this locality, I think some such supposition is rendered likely.

Cythere (?) acerosa, *Brady.* Although extremely rare, this species seems to be widely distributed in the deeper water outside Belfast Lough, having been found in no less than five gatherings.

Cytheridea subflavescens, *Brady.* Five or six typical specimens of this extremely rare species have been found.

Lopocoucha cuneiformis, *n. sp. Brady MS.* (Plate xxv., figs. 1-2.) Only one specimen, a male, of this species has been found. Carapace of male, as seen from the side, oblong, subrhomboidal, higher in front than behind, greatest height equal to half the length; anterior extremity broad, marked with a few radiating hair-like lines, well rounded below, and sloping steeply backwards above, where it forms an obtuse angle with the dorsum; posterior narrow, and obliquely rounded below; superior margin straight, inferior slightly sinuated in front of the middle, and produced into a thin laminar process behind, which is continued round the posterior border. Outline, as seen from above, cuneate, greatest width in front of the middle, and scarcely equal to height; acutely pointed in front, somewhat more obtusely behind. Shell pellucid, polished, thickly covered with very fine puncta, and a few distinct elevated papillae.

Cytherepteron Montrosiense, *B. C. and R.* Only a single valve of this species has been found.

Bythocythere pavo, *n. sp. Brady MS.* (Plate xxv., figs. 5-7.) Only six specimens of this species have been seen, all from the dredging off Black Head. It has been previously found by Dr. Brady and the Rev. A. M. Norman, but has not been described. Carapace of female, as seen from the side, oblong, subquadrilateral; nearly equal in height throughout; height equal to half the length, extremities rounded; superior margin straight, inferior slightly sinuated in the middle. Seen from above ovate, greatest width behind the middle, and nearly equal to half the length; anterior extremity muncronate, posterior evenly rounded. End view triangular, with rounded angles; height slightly greater than width. Surface of shell thickly covered with fine punctures and large white papillae. Length, 1-100th inch. Dr. Brady informs me that most of his specimens have a slight lateral crest, which mine do not show.

Cytheridels foveolata, *Brady.* (Plate xxv., figs. 8-12.) This species, which has not been previously found in Britain, seems to be confined to

the deeper water, although the first specimen was in shore sand from Portrush, where it had probably been washed up. Dr. Brady informs me that my specimens differ from the types obtained by him from the Gulf of St. Lawrence, in being rather stouter, less depressed in front, less distinctly punctated, rather smaller, and in having the ventral overlap of the valves in the opposite direction.

Paradoxostoma truncatum, *n. sp.* (Plate xxv., figs. 3-4.) About a dozen specimens of this species have been found in a single locality off Coalpit Bay, but it has not been seen anywhere else. Carapace, as seen from the side, compressed, irregularly ovate, greatest height in the middle, and equal to rather more than half the length. Anterior margin nearly straight, and sloping upwards almost at right angles to the anterior part of the dorsal margin; posterior extremity evenly rounded. Superior margin well arched, sloping somewhat steeply in front; inferior sinuated in front of the middle. Outline, as seen from above ovate—extremities pointed, widest in the middle; greatest width equal to rather more than one-third the length. Valves pellucid, white, or slightly ochreous. Length, 1-60th inch.

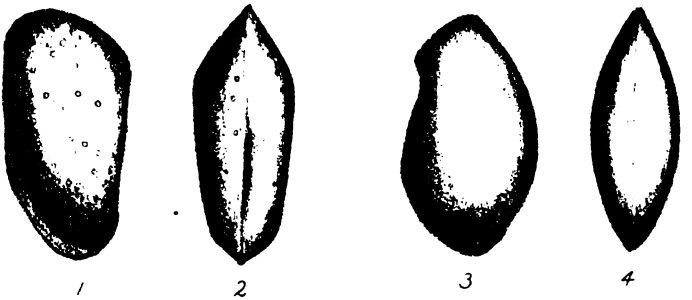
Cytherella Scotica, *Brady.* Only a single valve of this species has been found.

TABLE GIVING PARTICULARS OF DEPTHS, &c., OF THE STATIONS.

	LOCALITIES.	Depth in fathoms.	Sea Bottom.	Quantities of material examined.	Number of species from each locality.
Irish Channel, "Protector". dredgings	Five miles S.S.E. of Maidens Light-houses ..	60	Muddy sand.	No record kept.	51
	Two miles S. of Maidens Light-houses ..	60	ditto.		30
	Four miles E. of Gobbins	60	ditto.		43
	Six miles E.S.E. of Blackhead	30	Sand.		41
	Two miles S.S.E. of Maidens Light houses ..	72	Sand and zoophites.	11 oz.	31
	Three miles S.S.E. of Maidens Light-houses ..	62	Sand.	5 lbs 13 oz	45
	Two miles S. of Maidens Light-houses ..	60	Sand.	8 lbs	46
	Two miles N.E. of Muck Island	50	Stones and shells.	4 oz	7
	One mile off Blackhead and Gobbins ..	15-18	Mud, sand, shell, & Polyzoa, several gatherings.	6 lbs 5 oz	56
	Quarter mile off Coalpit Bay	13	Sponges.	7 oz	35
	Between Copeland Islands and land ..	6	Sand and broken shells.	——	9
Belfast Lough.	Off Whitehead	10	Sand and dead shells.	3 lbs	62
	Off Whitehead	8	Muddy sand.	13 lbs 12 oz	58
	Off Greypoint, mid-channel	6	Sand and dead shells.	3 lbs	30
	Off Rockport.	4	ditto.	9 oz	24
	Bangor Bay	5	ditto.	9 oz	15
Shore Gatherings.	Holywood Bank..	Between tides.	Fine sand.	8 lbs	23
	Rockport, County Down	ditto.	Coarse sand from rock pools.	20 lbs	69
	Donaghadee	ditto.	Fine sand.	8 lbs	32
	Between Carrickfergus and Kilroot	ditto.	ditto.	8 lbs	36
	Brown's Bay, Islandmagee	ditto.	Sand.	1 lb 1 oz	56

EXPLANATION OF PLATE XXV.

Fig. 1.	*Loxoconcha cuneiformis.*	Carapace of male, seen from left side
Fig. 2.	,,	Carapace of male, seen from above
Fig. 3.	*Paradoxostoma truncatum.*	Carapace of female, seen from left side.
Fig. 4.	,,	Carapace of female, seen from above.
Fig. 5.	*Bythocythere pavo.*	Carapace of female, seen from left side.
Fig. 6.	,,	Carapace of female, seen from above.
Fig. 7.	,,	Carapace of female, seen from below.
Fig. 8.	*Cytheridea foveolata.*	Carapace of female, seen from left side.
Fig. 9.	,,	Carapace of female, seen from above.
Fig. 10.	,,	Carapace of female, seen from below.
Fig. 11.	,,	Carapace of male, seen from left side.
Fig. 12.	,,	Carapace of male seen from above.



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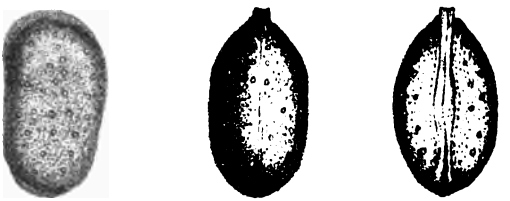

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MALCOMSON _ OSTRACODA OF BELFAST LOUGH.

(*Proceedings Belfast Naturalists' Field Club.—Appendix* 1884-85.)

The Fungi of the North of Ireland.

PART I.

By HENRY WILLIAM LETT, M.A., Trin. Coll., Dublin

The earliest writers who mention any of the Fungi of the North of Ireland appear to be the editors of "The Antient and Present State of the County of Down: Dublin, 1744." This book is now generally known as Harris's County Down, from a Mr. Walter Harris having had the principal share in its compilation. And the next is, Dr. Taylor, of County Cork, who wrote nearly half a century ago.

Harris's Down gives "A catalogue of the more rare Plants found spontaneously growing in the County of Down in May, 1743, by an expert Botanist employed for that purpose, and examined in Dublin by some well skilled in that branch of knowledge." These plants number exactly forty, and four are Fungi, which are described at p. 183 as follows.

"28. Fungus Arboreus acetabuli modo cavus, coccineus, marginibus pilosis. *Raii Syn.* Fungoides coccineum oris pilosis, acetabuli forma. *Tournf. Inst.* It grows on rotten oaks in Kilwarlin near Hillsborough in June." There can be no doubt this is *Peziza coccinea* (Jacq).

"29. Fungus Pileatus major supernè coloris Castanei, lamellis Candidis, caule maculato. *Raii Syn.—Chesnut-coloured Mushroom with white Gills and spotted Stalk.* Dr. *Sherard* found this in the County of Down, but has omitted to mention the particular place where."

"30. Fungus pulverulentus, Crepitus Lupi dictus major pediculo longiori ventricoso. *Raii Hist.—Dusty Mushroom the greater*, with a long, tumid foot stalk, found at *Moyra* and other parts." This and the next are evidently Puffballs.

"31. Fungus pulverulentus, Crepitus Lupi dictus, pediculo longiori scabro. Dr. *Sherard. Dusty Mushroom* with a long rough foot stalk, found at *Waringstown.*"

The Dr. Sherard whose name occurs twice in connection with these four plants may be regarded as the first Ulster fungologist. Perhaps some more of his observations may be unearthed by future researches.

The next worker in this department of the Botany of the district was Templeton, who carried on the collection and study of the Fungi found near Belfast more than eighty years ago, with the result of whose efforts the authors of the "B.N.F.C. Guide to Belfast, &c.," were unacquainted. Those efforts are embodied in a paper in the *Annals of Natural History, Vol. V., pp.* 3-6, 1840, the title of which is—"Catalogue of the Species of Fungi obtained in the North of Ireland by John Templeton, Esq., of Cranmore, Belfast," by "Thomas Taylor, M D., M.R.I.A., F.L.S." And to the list is the following preface:—"Dunkerron, Kenmare, 12th March, 1839.—The following Catalogue of Fungi, collected by the late Mr. John Templeton in the vicinity of Belfast, is drawn up from drawings and specimens left by him, and which Mrs. Templeton placed in my hands, with a desire that I should carefully ascertain the species and their modern names, with a view to publication. I have bestowed upon them my best attention, and yet the list is deficient by a few of the drawings whose counterparts I have not yet met with in nature, and by a very few of the specimens, from whose imperfect state no satisfactory conclusions could be drawn. Still, I cannot but admire the industry and talents of one who, at least equally successful in all the other departments of zoology and botany, displayed so intimate a knowledge of plants difficult of investigation, at least before the termination of the last century, when the greater part of this collection was already made.—THOMAS TAYLOR."

The 226 Species collected by Templeton are inserted in the following Catalogue, which, for convenience of reference, is arranged according to M. C. Cooke's, *Handbook of British Fungi, pp.* 901 (London, 1871), whose descriptions are referred to, except where otherwise stated. As I have adopted the classification used in that work, I have not thought it advisable to give the titles of the Families and Orders as they occur.

Two forms of *Sclerotium* (*complanatum*, Tode. and *durum*, Pers) collected by Templeton have been omitted, as they are regarded by modern mycologists as immature states. Wherever necessary the Synonyms employed by Taylor have been added.

There are six of Templeton's species which, owing to being unable to consult any of the older writers on British Fungi, I cannot trace to their modern Synonyms, and therefore, for the present, enumerate them here. These are:—

Thelephora aurantiaca,	Sow.
Peziza aquatica,	De Cand.
Peziza lycoperdioides,	De Cand.
Tremella difformis,	With.
Sphæria rimosa,	Sow.
Demantium ciliare,	Pers.

It may here be inquired, what has become of Templeton's drawings and specimens, and would it be possible to have them placed in the Herbarium of the Museum of Belfast, near the scenes of his varied and many labours for science, and the town close to which he had his home, and with which his name will be always associated? The Belfast Museum already possesses, through the generosity of Mr. Robert M. Young, a small collection of cryptogamic plants made by Templeton between the years 1801-1809, which contains a few specimens of Fungi, but, as they are not marked with any localities, I regret my inability to recognise them as Irish.

However, a more interesting and important discovery has been lately made by Mr. S. A. Stewart, F.B.S.E., who has found amongst Mr. W. Thompson's papers on the Museum shelves, a number of Fungi collected by that genius of varied talents, some of which I was glad to find were natives of the North, and will be found duly recorded in my list.

It would seem that nothing has been done since Mr. Templeton's time to study the Fungi of our district, except the few species brought together by the author of the Natural History of Ireland. But recently attention has been given to the subject by several students of nature, whose specimens I have had the pleasure of inspecting, and a certain public interest has been excited about "Toad stools," as was evidenced by the attendances at the Fungus Forays of 1883, to Shane's Castle, County Antrim; of 1884, to Killymoon, near Cookstown, County Tyrone; and of 1885, to Rademon, near Crossgar, County Down. The work effected by the B.N.F.C. on those occasions can be estimated from the frequent mention of those localities in the accompanying pages.

The present list contains 582 species, and is intended as the beginning of a Catalogue which, it is expected, will be continued from time to time. It embraces only a small portion of the Fungi of the North of Ireland, and these from merely a few localities, a large number of the most common species not being recorded in it, a deficiency which time and patience can, and doubtless will, supply. There remain in my possession many specimens and drawings of undecided forms, which I have not been able to clear off in time for this report.

In the identification of species, much assistance has been afforded me by W. B. Grove, Esq., B.A., of Manchester, and Greenwood Pim, Esq., M.A., F.L.S., of Monkstown, County Dublin, who have taken a great deal of trouble with many difficulties that I submitted to their judgment. Mr. Pim, who has been working for some years on the Fungi of Leinster and Munster, added to his favours by spending two pleasant days with me in September, 1885, when we had the satisfaction of verifying more than 80 species among the woods of Donard Demesne, and Tollymore Park. I hope that the other kind friends who have contributed specimens will continue and extend their observations till the records are completed for all the counties in Ulster.

NOTE.—The plants included in this Part which I did not collect—except Templeton's in Taylor's list—have been all examined by me, and in nearly every instance in a living state.—H. W. L.

1. Agaricus (Amanita) vaginatus. *Bull.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Rosstrevor and Narrow Water Woods, County Down, 1883; Killymoon, County Tyrone, 1884; and Rademon, County Down, 1885.—H. W. L.

2. Agaricus (Amanita) cecilise. *B. and Br.*

Narrow Water Wood, Co. Down, 1883. Rare.—H. W. L.

3. Agaricus (Amanita) adnatus. *Smith.*

Ardmore Glebe, Co. Armagh, 1884. Very rare.—H. W. L.

4. Agaricus (Amanita) phalloides. *Fr.*

Near Belfast, Templeton (*Agaricus bulbosus, Sow.*). Ann. Nat. Hist., Vol. V. Narrow Water Wood, Co. Down, 1883; and Killymoon, Co. Tyrone, 1884.—H. W. L.

5. Agaricus (Amanita) mappa. *Batsch.*

Several under trees near the grotto in Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

6. Agaricus (Amanita) muscarius. *L.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Shane's Castle Park, Co. Antrim; Wood at the Ferry Hill, near Omeath, Co. Louth, and Raughlan, Co. Armagh, 1883; Donard Demesne, Rademon, and Tollymore Park, County Down, 1885. Abundant in fir and birch woods.—H. W. L.

7. Agaricus (Amanita) pantherinus. *D.C.*

Donard Demesne, Co. Down, 1884. Rare.—H. W. L.

8. Agaricus (Amanita) rubescens. *P.*

Warrenpoint, County Down, 1883; Killymoon, Co. Tyrone, 1884; Donard Demesne, and Tollymore Park, Co. Down, 1885. Abundant in both woods.—H. W. L.

9. Agaricus (Lepiota) procerus. *Scop.*

Ardmore Glebe, Co. Armagh, and sandhills at Newcastle, County Down, abundant, 1884; Rademon, Co. Down, 1885.—H. W. L.

10. Agaricus (Lepiota) rachodes. *Vitt.*

In a plantation at Raughlan, Co. Armagh, 1883.—H. W. L.

11. Agaricus (Lepiota) gracilentus. *Krombh.*

Abundant among the sandhills at Newcastle, Co. Down, 1884.—H.W.L.

12. Agaricus (Lepiota) clypeolarius. *Bull.*

Near Belfast, Templeton, Ann. Nat. Hist. Vol. V.

13. Agaricus (Lepiota) cristatus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. In the lawn near the Castle of Killymoon, Co. Tyrone, 1884.—H. W. L.

14. Agaricus (Lepiota) granulosus. *Batsch.*

I have collected this pretty species on the summit of Slieve Donard, which rises to a height of 2,796 feet, and among the sandhills near Newcastle, Co. Down, where it was abundant in the short grass only a few feet above the sea level, 1883. Tollymore Park, Co. Down, 1885.—H. W. L.

15. Agaricus (Lepiota) granulosus *var.* **carcharias.** *Pers.*

In a plantation near Holywood, Co. Down, 1883—R. L. Praeger; top of Knockbarragh Hill, Co. Down, 1883.—H. W. L.

16. Agaricus (Armillaria) mellcus. *Vahl.*

Shane's Castle, Co. Antrim, and Ardmore Glebe, Co. Armagh, 1883; Rademon, Tollymore Park, and Donard Demesne, Co. Down, 1885. Most abundant in late autumn.—H. W. L.

17. Agaricus (Armillaria) mucidus. *Fr.*

Lurgan Demesne, Co. Armagh, and Killymoon, Co. Tyrone, 1884.—H.W.L.

18. Agaricus (Tricholoma) flavo brunneus. *Fr.*

Maralin, Co. Down, 1884.—C. H. Waddell.

19. Agaricus (Tricholoma) albo brunneus. *P.*

Ardmore Glebe, County Armagh, 1882; Donard Lodge, County Down 1885.—H. W. L.

20. Agaricus (Tricholoma) rutilans. *Schæff.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Wood at the Ferry Hill, near Omeath, Co. Louth, 1883; Donard Demesne, and Tollymore Park, Co. Down, 1884.—H. W. L.

21. Agaricus (Tricholoma) sculptaturus. *Fr.*

Wood at the Ferry Hill, near Omeath, Co. Louth, 1883.—H. W. L.

22. Agaricus (Tricholoma) columbetta. *Fr.*

Killymoon, County Tyrone, 1884.—H. W. L.

23. Agaricus (Tricholoma) imbricatus. *Fr.*

In fir plantation, Donard Demesne, Co. Down, 1884.—H. W. L.

24. Agaricus (Tricholoma) terreus. *Schæff.*

Killymoon, Co. Tyrone, 1884.—H. W. L.

25. Agaricus (Tricholoma) colossus. *Fr.*

A single specimen, in fine condition, under trees at rere of Warrenpoint Church, Co. Down, 1883.—H. W. L.

26. Agaricus (Tricholoma) gambosus. *Fr.*

Islandmagee, Co. Antrim, and Ardmore and Derrytrasna, Co. Armagh, 1884. This is very abundant and large every year in the latter localities.—H. W. L.

27. Agaricus (Tricholoma) albus. *Fr.*

Rosstrevor Wood, 1883, and Donard Demesne, 1884, Co. Down.—H. W. L.

28. Agaricus (Tricholoma) grammopodius. *Bull.*

Donard Demesne, Co. Down, 1885.—G. Pim, and H. W. L.

29. Agaricus (Tricholoma) militaris. *Lasch.*

A single specimen, in fine condition, at Rademon, County Down, 1885.—H. W. L.

30. Agaricus (Tricholoma) nudus. *Fr.*

Raughlan, County Armagh, 1883.—H. W. L.

31. Agaricus (Clitocybe) nebularis. *Batsch.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. In abundant clusters and rings in Shane's Castle Park, Co. Antrim, 1885. Scarce in Tollymore Park, Co. Down, 1885.—H. W. L. In a very perfect ring, seven yards across, the plants so thick as to be riding on each other, at Glenmore, near Lisburn, Co. Antrim, 1885.—J. H. Davies. I went to see this.—H. W. L.

32. Agaricus (Clitocybe) odorus. *Bull.*

Donard Demesne, and Tollymore Park, County Down, 1885.—G. Pim, and H. W. L.

33. Agaricus (Clitocybe) cerussatus. *Fr.*

In a fir wood in Tollymore Park, 1884, and Donard Demesne, 1885, Co. Down.—H. W. L.

34. Agaricus (Clitocybe) dealbatus. *P.*
Killymoon, Co. Tyrone, 1884.—H. W. L.

35. Agaricus (Clitocybe) elixus. *Sow.*
Ardmore Glebe, Co. Armagh, 1882.—H. W. L.

36. Agaricus (Clitocybe) fumosus. *P.*
Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

37. Agaricus (Clitocybe) giganteus. *Fr.*
Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

38. Agaricus (Clitocybe) maximus. *Fr.*
Near the Vicarage, Warrenpoint, Co. Down, 1883.—H. W. L.

39. Agaricus (Clitocybe) geotrupus. *Bull.*
Near the Saw-mill in Tollymore Park, Co. Down, 1884.—H. W. L.

40. Agaricus (Clitocybe) inversus. *Scop.*
Under Scotch firs at Raughlan, Co. Armagh, 1884.—H. W. L.

41. Agaricus (Clitocybe) gilvus. *Pers.*
This species is described in Grevillea, No. 65, p. 55, of the new issue of Cooke's White-spored Hymenocetes. Rademon, Co. Down, 1885.—H. W. L.

42. Agaricus (Clitocybe) flaccidus, *var.* **lobatus.** *Sow.*
Derryadd, near Lurgan, Co. Armagh, 1884.—H. W. L.

43. Agaricus (Clitocybe) cyathiformis. *Fr.*
Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.; Donard Demesne, Co. Down, 1885.—H. W. L.

44. Agaricus (Clitocybe) brumalis. *Fr.*
Roadside, in several places, Derrytrasna, Co. Armagh, 1884.—H. W. L.

45. Agaricus (Clitocybe) fragrans. *Sow.*
Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.; Donard Demesne, Co. Down, 1885.—G. Pim, and H. W. L.

46. Agaricus (Clitocybe) ectypus. *Fr.*
Donard Demesne and Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

47. Agaricus (Clitocybe) bellus. *Fr.*
Near Ardmore School, Co. Armagh, 1885.—H. W. L.

48. Agaricus (Clitocybe) laccatus. *Scop.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.; Narrow Water Demesne and Donard Demesne, Co. Down, and Shane's Castle Demesne, Co. Antrim, 1883; Killymoon, Co. Tyrone, 1884; Rademon, County Down, 1885. —H. W. L.

49. Agaricus (Clitocybe) laccatus *var.* **amethystinus.** *Bot.*

In a wood at the Ferry Hill, near Omeath, Co. Louth, and Shane's Castle Demesne, Co. Antrim, 1883. Not common.—H. W. L.

50. Agaricus (Clitocybe) gilvus. *Pers.*

Rademon, Co. Down, 1885.—H. W. L.

51. Agaricus (Pleurotus) corticatus. *Fr.*

Several on decaying "sleepers" of the railway near the sandhills, at Newcastle, Co. Down, 1885. I gathered these on the Excursion of the B.N.F.C. in July to the Mourne Mountains.—H. W. L.

52. Agaricus (Pleurotus) dryinus. *P.*

A few specimens on an aged elm tree, Ardmore Glebe, County Armagh, 1884.—H. W. L.

53. Agaricus (Pleurotus) ulmarius. *Bull.*

A few specimens on a decaying elm, Ardmore Glebe, Co. Armagh, 1884. —H. W. L.

54. Agaricus (Pleurotus) salignus. *Fr.*

Abundant on a dead poplar tree, Derryadd, near Lurgan, Co. Armagh, 1882. This appeared for several years on the same trunk. I have not found it elsewhere.—H. W. L.

55. Agaricus (Pleurotus) acerosus. *Fr.*

On the shady side of a clay bank in Ardmore Glebe garden, Co. Armagh, 1885.—H. W. L,

56. Agaricus (Pleurotus) applicatus. *Batsch.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.; Killymoon, County Tyrone, 1884.—H. W. L.

57. Agaricus (Collybia) radicatus. *Relh.*

In a wood at the Ferry Hill, near Omeath, County Louth, and Lurgan Demesne, Co. Armagh, 1883; Tollymore Park, and Donard Demesne, Co. Down, 1884.—H. W. L.

58. Agaricus (Collybia) maculatus. *A. and S.*

Shore of Lough Neagh, at Derryadd, near Lurgan, Co. Armagh, 1883. Very rare.—H. W. L.

59. Agaricus (Collybia) butyraceus. *Bull.*

Near Belfast, Templeton, Ann. Nat. Hist, Vol. V. Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L,

60. Agaricus (Collybia) velutipes. *Curt.*

On elm, poplar, &c., when felled. Co. Armagh, 1882; Co. Down, 1884; Co. Antrim, 1885. Very common and abundant.—H. W. L.

61. Agaricus (Collybia) caulicinalis. *Bull.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Ardmore, County Armagh, 1883.—H. W. L.

62. Agaricus (Collybia) confluens. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Killymoon, County Tyrone, 1884; Donard Demesne, Co. Down, 1885.—H. W. L.

63. Agaricus (Collybia) dryophilus. *Bull.*

Wood at the Ferry Hill, near Omeath, Co. Louth, 1883; Killymoon, Co. Tyrone, 1884; Donard Demesne, Co. Down, 1885.—H. W. L.

64. Agaricus (Collybia) clavus. *Bull.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

65. Agaricus (Mycena) pelianthinus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

66. Agaricus (Mycena) elegans. *P.*

Killymoon, County Tyrone, 1884.—H. W. L.

67. Agaricus (Mycena) purus. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Donard Demesne, County Down, 1885.—G. Pim, and H. W. L.

68. Agaricus (Mycena) lacteus. *P.*

Donard Demesne, Co. Down, 1885.—G. Pim, and H. W. L.

69. Agaricus (Mycena) galericulatus. *Scop.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Rademon, Co. Down, 1885.—H. W. L.

70. Agaricus (Mycena) alcalinus. *Fr.*

Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

71. Agaricus (Mycena) tenellus. *Schum.*

Ardmore Glebe, Co. Armagh, 1885.—H. W. L.

72. Agaricus (Mycena) cruentus. *Fr.*

Shane's Castle Demesne, Co. Antrim, 1883.—H. W. L.

73. Agaricus (Mycena) epipterygius. *Scop.*

Donard Demesne, Tollymore Park, and Rademon, County Down, 1885.—H. W. L.

74. Agaricus (Mycena) pelliculosus. *Fr.*

Bog at Raughlan, Co. Armagh, 1883.—H. W. L.

75. Agaricus (Mycena) roridus. *Fr.*

On dead bramble stem, Ardmore Glebe, Co. Armagh, and Rademon, Co. Down, 1885.—H. W. L.

76. Agaricus (Mycena) stylobates. *P.*

Abundant in Donard Demesne, Co. Down, 1885.—G. Pim, and H. W. L.

77. Agaricus (Mycena) corticola. *Schum.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. On old elm trees, Ardmore Glebe, Co. Armagh, 1883.—H. W. L.

78. Agaricus (Mycena) cohærens. *P.*

For the description of this species, see Fries's Epic., 2nd ed., 1874, p. 137; also Grevillea, Vol. I., p. 174. Near Belfast, Templeton, Ann. Nat. Hist. Vol. V.

79. Agaricus (Omphalia) pyxidatus. *Bull.*

In short grass, Killymoon, County Tyrone, 1884.—H. W. L.

80. Agaricus (Omphalia) umbelliferus. *L.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Common in County Armagh, and among the Mourne Mountains, Co. Down. Near top of Slieve Donard, Co. Down, 1883; top of Shan Slieve, Co. Down, 1885.—H. W. L.

81. Agaricus (Omphalia) stellatus. *Sow.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

82. Agaricus (Omphalia) griseus. *Fr.*

Donard Demesne, and Rademon, Co. Down, 1885.—H. W. L.

83. Agaricus (Omphalia) fibula. *Bull.*

Narrow Water Demesne, Co. Down, 1883.—H. W. L.

84. Agaricus (Volvaria) bombycinus. *Schæff.*

I found one specimen, in perfect condition, on a fallen, decayed branch, in Killymoon Demesne, Co. Tyrone, 1884.—H. W. L.

85. Agaricus (Volvaria) speciosus. *Fr.*

A few were growing by the side of the road in Killymoon Demesne, Co. Tyrone, B.N.F.C. Excursion, 1884.—H. W. L.

86. Agaricus (Pluteus) cervinus. *Schæff.*

On the dead stump of a willow tree at Ardmore Glebe, County Armagh, 1884.—H. W. L

87. Agaricus (Entoloma) helodes. *Fr.*

On peaty soil, Ardmore Glebe, County Armagh, and Donard Demesne, Co. Down, 1884.—H. W. L.

88. Agaricus (Entoloma) ameides. *B. and Br.*

What Fries calls the "odor peculiaris" of this plant seems to me to resemble the smell of phosphorus or damp matches. Tollymore Park, County Down, 1885.—G. Pim, and H. W. L.

89. Agaricus (Entoloma) jubatus. *Fr.*

Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

90. Agaricus (Entoloma) clypeatus. *L.*

Near Belfast, Templeton (*Entoloma fertilis*), Ann. Nat. Hist., Vol. V.

91. Agaricus (Entoloma) rhodopolius. *Fr.*

Donard Demesne and Tollymore Park, County Down, 1885.—G. Pim, and H. W. L.

92. Agaricus (Entoloma) sinuatus. *Fr.*

Near Belfast, Templeton (*Agaricus, Entoloma fertilis, Pers.*), Ann. Nat. Hist., Vol. V.

93. Agaricus (Entoloma) sericeus. *Bull.*

Narrow Water Demesne, Co. Down, and Ardmore Glebe, Co. Armagh, 1883.—H. W. L.

94. Agaricus (Entoloma) nidorosus. *Fr.*

Donard Demesne, and Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

95. Agaricus (Clitopilus) prunulus. *Scop.*

Shane's Castle Demesne, Co. Antrim, 1888.—H. W. L.

96. Agaricus (Claudopus) variabilis. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Maralin, Co. Down, 1884.—C. H. Waddell.

97. Agaricus (Leptonia) chalybæus. *P.*

Near Belfast, Templeton, Ann. Nat Hist., Vol. V.

98. Agaricus (Nolanea) pascuus. *P.*

Near Belfast, Templeton, Ann Nat. Hist., Vol. V.

99. Agaricus (Nolanea) rufo-carneus. *Berk.*

Among heather in a bog at Derryadd, near Lurgan, Co. Armagh, 1884; Tollymore Park, Co. Down, 1885.—H. W. L.

100. Agaricus (Pholiota) squarrosus. *Müll.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Holywood, Co. Down, 1883—R. L. Praeger. Ardmore, County Armagh, 1883; Tollymore Park, Co. Down, 1885.—H. W. L.

101. Agaricus (Pholiota) spectabilis. *Fr.*

Near Belfast, Templeton (*A. aureus, Bull*), Ann. Nat. Hist., Vol. V. On a felled apple tree, Ardmore Glebe, Co. Armagh, 1888.—H. W. L.

102. Agaricus (Pholiota) aureus. *Bull.*

A plant so named occurs in Dr. Taylor's List of Templeton's Fungi, and may for convenience be placed here. Fries, in his Epicrisis, 2nd edition 1874, p. 317, says of it—"Qui fons nominis *A. aurei* plane diversa tam a nostro *A. aureo* quam *A. spectabili*, lamellis angustis albis mox distinctus, sed affinitatis dubiæ."

103. Agaricus (Pholiota) junonius. *Fr.*

In a decaying willow at Raughlan, Co. Armagh, 1884.—H. W. L.

104. Agaricus (Pholiota) mutabilis. *Schæff.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

105. Agaricus (Hebeloma) sinapizans. *Fr.*

Killymoon, Co. Tyrone, 1884; Rademon, Co. Down, 1885.—H. W. L.

106. Agaricus (Hebeloma) crustuliniformis. *Bull.*

Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

107. Agaricus (Hebeloma) fastibilis. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Ardmore Glebe, Co. Armagh, 1884,—H. W. L.

108. Agaricus (Hebeloma) flocculentus. *Poll.*

Donard Demesne, Co. Down, 1885.—G. Pim, and H. W. L.

109. Agaricus (Hebeloma) plumosus. *Bolt.*

Donard Demesne, Co. Down, 1885.—G. Pim, and H. W. L.

110. Agaricus (Hebeloma) scaber. *Müll.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

111. Agaricus (Hebeloma) fibrosus. *Sow.*

Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

112. Agaricus (Hebeloma) rimosus. *Bull.*

On summits of the Sallagh Braes, Co. Antrim, and Killymoon, County Tyrone, 1884.—H. W. L.

113. Agaricus (Hebeloma) geophyllus. *Sow.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Donard Demesne, and Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

114. Agaricus (Hebeloma) calamistratus. *Fr.*

In shady grass by the side of a path in Donard Demesne, Co. Down, 1884.—H. W. L. (See Fries, Epic., 2nd edition, 1874, p. 227.)

115. Agaricus (Flammula) flavidus. *Schæff.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

116. Agaricus (Flammula) sapineus. *Fr.*

Donard Demesne, Co. Down, 1885.—G. Pim, and H. W. L

117. Agaricus (Crepidotus) mollis. *Schæff.*

On decaying wood in Rosstrevor Wood, 1883, and Tollymore Park, Co. Down, 1884.—H. W. L.

118. Agaricus (Naucoria) escharoides. *Fr.*

Ardmore Glebe, Co. Armagh, 1883; Killymoon, Co. Tyrone, 1884.—H. W. L.

119. Agaricus (Galera) tener. *Schæff.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Abundant in dungy

spots among grass on Lough Neagh shore, at Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

120. Agaricus (Galera) hypnorum. *Batsch.*

In a bog near the Bannfoot, Co. Armagh, 1884; Donard Demesne, and Tollymore Park, Co. Down, 1885.—H. W. L.

121. Agaricus (Galera) sphagnorum. *Pers.*

Anglesey Mountain, near Omeath, Co. Louth, 1883; Derryinver Bog, Co. Armagh, 1884.—H. W. L.

122. Agaricus (Psalliota) arvensis. *Schæff.*

Near Belfast, Templeton (*A. Georgii*), Ann. Nat. Hist., Vol. V. Ardmore, Co. Armagh, 1882; Tollymore Park, Co. Down, 1885.—H. W. L.

123. Agaricus (Psalliota) arvensis *var.* **villaticus.** *Brand.*

Raughlan, and Derryadd, Co. Armagh, 1883.—H. W. L. A specimen weighing 7½ oz., and measuring 8 in. high and 10 in. in diameter, was sent to me by S. A. Stewart, from a wood by the river near Downpatrick, 19th August, 1885. (See Fries, Epic., 2nd edition, p. 280.)

124. Agaricus (Psalliota) campestris. *L.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. The Common Meadow Mushroom is common, and in some cases abundant, all through the North of Ireland.—H. W. L.

var. pratensis. *Vitt.*

Raughlan, Co. Armagh, 1885.—H. W. L.

var. silvicola. *Vitt.*

Derryadd, near Lurgan, Co. Armagh, 1885.—H. W. L.

125. Agaricus (Stropharia) æruginosus. *Curt.*

Killymoon, Co. Tyrone, Massereene Park, Co. Antrim, 1884; Ardmore Glebe, Co. Armagh, Donard Demesne, and Tollymore Park, Co. Down, 1885.—H. W. L.

126. Agaricus (Stropharia) semiglobatus. *Batsch.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Ardmore Glebe, Co. Armagh, 1883; Rademon, Co. Down, 1885.—H. W. L.

127. Agaricus (Hypholoma) sublateritius. *Fr.*

Abundant on an old stump near the entrance to Killymoon Demesne from Cookstown, Co. Tyrone, 1884.—H. W. L.

128. Agaricus (Hypholoma) epixanthus. *Fr.*

In a wood at the Ferry Hill, near Omeath, Co. Louth, 1883.—H. W. L.

129. Agaricus (Hypholoma) fasciculariis. *Hud.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Common and abundant everywhere. Ardmore, Co. Armagh, Maralin, Donard Demesne, Tollymore Park, and Rademon, Co. Down, 1885.—H. W. L.

130, Agaricus (Hypholoma) fasciculariis *var.* **robustior.** *Pers.*

Ardmore, Co. Armagh, 1885.—H. W. L. (See Fries, Epic., 2nd ed., p. 292.)

131. Agaricus (Hypholoma) lacrymabundus. *Fr.*

Rademon, Co. Down, 1885.—H. W. L.

132. Agaricus (Hypholoma) appendiculatus. *Bull.*

Ardmore Glebe, Co. Armagh, 1884; Rademon, Co. Down, 1885.—H. W. L.

133. Agaricus (Psilocybe) fœnisecii. *P.*

Raughlan, 1884, and Ardmore Glebe, Co. Armagh, 1885.—H. W. L.

134. Agaricus (Panæolus) separatus. *L.*

Near Belfast, Templeton (*Ag. semiovatus*), Ann. Nat. Hist., Vol. V. Shore of Lough Neagh, at Derryadd, near Lurgan, Co. Armagh, 1883; Killymoon, Co. Tyrone, 1884; Slieve Donard, Co. Down, 1885.—H. W. L.

135. Agaricus (Panæolus) fimiputris. *Bull.*

Ardmore Glebe, Co. Armagh, 1883; Killymoon, Co. Tyrone, 1884.—H. W. L.

136. Agaricus (Psathyrella) hiascens. *Fr.*

In the garden at Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

137. Agaricus (Psathyrella) disseminatus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Warrenpoint, County Down, 1883.—H. W. L.

138. Coprinus comatus. *Fr.*

Ardmore, and Raughlan, Co. Armagh, 1883; Drumcro, and Rosstrevor, Co. Down, Cookstown, Co. Tyrone, 1884.—H. W. L.

139. Coprinus ovatus. *Fr.*

Killymoon, Co. Tyrone, 1884.—H. W. L.

140. Coprinus atramentarius. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Derryadd, County Armagh, 1883; Rademon, Co. Down, 1885.—H. W. L.

141. Coprinus fuscescens. *Fr.*

Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

142. Coprinus picaceus. *Fr.*

Derryadd, near Lurgan, 1882, and Ardmore Glebe, Co. Armagh, 1885. Very rare.—H. W. L.

143. Coprinus niveus. *Fr.*

Derrymacash, Co. Armagh, 1885. Rare.—H. W. L.

144. Coprinus micaceus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Ardmore Glebe, Co. Armagh; Killymoon, Co. Tyrone, 1884; Rademon, and Donard Lodge, Co. Down, 1885.—H. W. L.

145. Coprinus plicatilis. *Fr.*

Ardmore Glebe, Co. Armagh, Killymoon, Co. Tyrone, Donard Lodge, Co. Down, 1884.—H. W. L.

146. Coprinus hemerobius. *Fr.*

Narrow Water Demesne, Co. Down, in old pasture, 1883. Very rare.—H. W. L.

147. Bolbitius boltoni. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

148. Bolbitius fragilis. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

149. Bolbitius tener. *B.*

Abundant in grass on Rosstrevor Mountain, Co. Down, from 900 feet 1500 feet, 1883.—H. W. L.

150. Cortinarius (Phlegmacium) caperatus. *Fr.*

Shane's Castle Park, Co. Antrim, 1883.—H. W. L.

151. Cortinarius (Phlegmacium) varius. *Fr.*

Ardmore Glebe, Co. Armagh, 1883.—H. W. L.

152. Cortinarius (Phlegmacium) cyanipes. *Fr.*

Donard Demesne, Co. Down, 1885.—G. Pim, and H. W. L.

153. Cortinarius (Phlegmacium) purpurascens. *Fr.*

Ardmore Glebe, Co. Armagh, and Donard Demesne, Co. Down, 1885.—H. W. L.

154. Cortinarius (Phlegmacium) scaurus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

155. Cortinarius (Myxacium) collinitus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

156. Cortinarius (Inoloma) callisteus. *Fr.*

Donard Demesne, Co. Down, 1885.—G. Pim, and H. W. L.

157. Cortinarius (Inoloma) bulliardi. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

158. Cortinarius (Inoloma) sublanatus. *Fr.*

Near Belfast, Templeton, Ann. Nat Hist., Vol. V.

159. Cortinarius (Dermocybe) anomalus. *Fr.*

Tollymore Park, Co. Down, 1885.– G. Pim, and H. W. L.

160. Cortinarius (Dermocybe) cinnamoneus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Donard Demesne, and Tollymore Park, County Down, 1885.—G. Pim, and H. W. L.

161. Cortinarius (Telamonia) evernius. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

162. Cortinarius (Telamonia) gentilis. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

163. Cortinarius (Hygrocybe) dilutus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

164. Cortinarius (Hygrocybe) acutus. *Fr.*

Bank of the Lagan, near Belfast, Co. Antrim, B.N.F.C. Excursion, July, 1884.—J. J. Andrew, and H. W. L.

165. Lepista personata. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Tollymore Park, Co. Down, and in plantation at Glenmore, near Lisburn, Co. Antrim, 1885.—H. W. L.

166. Paxillus involutus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Raughlan, and Ardmore Glebe, Co. Armagh, and Killymoon, Co. Tyrone, 1884; Rademon, and Donard Demesne, Co. Down, 1885.—H. W. L.

167. Hygrophorus eburneus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Tollymore Park, Co. Down, 1885.—H. W. L.

168. Hygrophorus pratensis. *Fr.*

Near the Ross Monument at Rosstrevor, and in Tollymore Park, Co. Down, 1885.—H. W. L.

169. Hygrophorus virgineus. *Fr.*

Goragh Wood, Co. Armagh, 1883. Abundant in short grass about Newcastle, Co. Down, 1884.—H. W. L.

170. Hygrophorus niveus. *Fr.*

Donard Demesne, Co. Down, 1885.—G. Pim, and H. W. L.

171. Hygrophorus ovinus. *Fr.*

Near Belfast, Templeton (*H. compressus, Sow.*), Ann. Nat. Hist., Vol. V.

172. Hygrophorus ceraceus. *Fr.*

Rosstrevor, 1883, and Donard Demesne, 1884, Co. Down.—H. W. L.

173. Hygrophorus coccineus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Among the sandhills at Newcastle, and Donard Demesne, Co. Down, 1885.—H. W. L.

174. Hygrophorus miniatus. *Fr.*

In grass at 1100 feet on Rosstrevor Mountain, Co. Down, 1883; at 2204 feet on Shan Slieve, Co. Down, 1885.—H. W. L.

175. Hygrophorus puniceus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist. Vol. V.

176. Hygrophorus obrusseus. *Fr.*

Rosstrevor Wood, Co. Down, 1883; Killymoon, Co. Tyrone, 1884.—H. W. L.

177. Hygrophorus conicus. *Fr.*

Ardmore, County Armagh, Killymoon, Co. Tyrone, and sandhills near Newcastle, Co. Down, 1884.—H. W. L.

178. Hygrophorus chlorophanus. *Fr.*

Clonallon, Co. Down, 1883; Killymoon, Co. Tyrone, 1884; Tollymore Park, Co. Down, 1885.—H. W. L.

179. Hygrophorus psittacinus. *Fr.*

Shane's Castle Park, Co. Antrim, 1883; Donard Demesne, County Down, 1885.—H. W. L.

180. Gomphidius glutinosus. *Fr.*

Raughlan, Co. Armagh, 1883. Abundant.—H. W. L.

181. Gomphidius viscidus. *Fr.*

Killymoon, Co. Tyrone, and Maralin, Co. Down, 1883.—C. H. Waddell. Raughlan, Co. Armagh, 1884.—H. W. L.

182. Lactarius torminosus. *Fr.*

Shane's Castle Park, Co. Antrim, 1883; Tollymore Park, County Down 1885.—H. W. L.

183. Lactarius cilicioides. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

184. Lactarius turpis. *Fr.*

Ardmore Glebe, Co. Armagh, 1884; Rademon, County Down, 1885.—H. W. L.

185. Lactarius controversus. *Pers.*

Ardmore Glebe, Co. Armagh, under trees in old pasturage, 1884; Tollymore Park, Co. Down, 1885.—H. W. L.

186. Lactarius zonarius. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Tollymore Park, Co. Down, 1885.—H. W. L.

187. Lactarius blennius. *Fr.*

Narrow Water Demesne, Co. Down, and a wood at the Ferry Hill, near Omeath, Co. Louth, 1883; Tollymore Park, Co. Down, 1885.—H. W. L.

188. Lactarius hysginus. *Fr.*

Rademon, Co. Down, 1885.—H. W. L.

189. Lactarius piperatus. *Fr.*

Ardmore Glebe, County Armagh, 1884; Tollymore Park, Co. Down, 1885.—H. W. L.

190. Lactarius vellereus. *Fr.*

Ardmore Glebe, Co. Armagh, 1885.—H. W. L.

191. Lactarius deliciosus. *Fr.*

Knockbarragh Hill, Co. Down, 1883; Killymoon, County Tyrone, and Raughlan, Co. Armagh, 1884; Donard Demesne, Co. Down, 1885.—H. W. L.

192. Lactarius pallidus. *Fr.*

Killymoon, Co. Tyrone, and Raughlan, Co. Armagh, very large, 1884; Tollymore Park, Co. Down, 1885.—H. W. L.

193. Lactarius quietus. *Fr.*

Ardmore Glebe, Co. Armagh, 1883; Killymoon, Co. Tyrone, 1884; Tollymore Park, Co. Down, 1885.—H. W. L.

194. Lactarius theiogalus. *Fr.*

Knockbarragh Hill, Co. Down, 1883.—H. W. L.

195. Lactarius rufus. *Fr.*

Killymoon, County Tyrone, and Raughlan, Co. Armagh, 1884; Donard Demesne, County Down, 1885.—H. W. L.

196. Lactarius glyciosmus. *Fr.*

Raughlan, Co. Armagh, under Scotch firs, 1884.—H. W. L.

197. Lactarius serifluus. *Fr.*

Ardmore Glebe, Co. Armagh, 1882; Shane's Castle Park, Co. Antrim, 1883; Killymoon, Co. Tyrone, 1884; Donard Demesne, Co. Down, 1885.—H. W. L.

198. Lactarius volemum. *Fr.*

Ardmore Glebe, Co. Armagh, abundant, 1883; Rademon, Co. Down, 1885.—H. W. L.

199. Lactarius mitissimus. *Fr.*

Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

200. Lactarius subdulcis. *Fr.*

Ardmore Glebe, Co. Armagh, 1883; Killymoon, County Tyrone, 1884.—H. W. L.

201. Lactarius pargamenus. *Sow.*

(For description see Fries, Epic., 2nd edition, 1874, p. 430.) Narrow Water Demesne, Co. Down, 1883.—H. W. L.

202. Russula nigricans. *Fr.*

Killymoon, Co. Tyrone, 1884; Rademon, and Tollymore Park, County Down, 1885. Not common.—H. W. L.

203. Russula adusta. *Fr.*

Rademon, Co. Down, 1885.—H. W. L.

204. Russula drimeia. *Cooke.*

Raughlan, Co. Armagh, 1884.—H. W. L.

205. Russula virescens. *Fr.*

Rosstrevor Wood, County Down, abundant, 1883; Tollymore Park, Co. Down, 1885.—H. W. L.

206. Russula rubra. *Fr.*

Raughlan Island, Co. Armagh, abundant, 1883; Killymoon, Co. Tyrone, 1884; Rademon, Co. Down, 1885.—H. W. L.

207. Russula heterophylla. *Fr.*

Killymoon, Co. Tyrone, 1884.—H. W. L.

208. Russula emetica. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Raughlan, County Armagh, 1883; Killymoon, Co. Tyrone, 1884; Tollymore Park, Co. Down, 1885.—H. W. L.

209. Russula fragilis. *Fr.*

Donard Demesne, Co. Down, 1885.—G. Pim, and H. W. L.

210. Russula integra. *Fr.*

Ardmore Glebe, Co. Armagh, 1883; Donard Demesne, Co. Down, 1885.—H. W. L.

211. Russula alutacea. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

212. Cantharellus cibarius. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Tollymore Park, Co. Down, 1883.—H. W. L.

213. Cantharellus aurantiacus. *Fr.*

Narrow Water Demesne, 1883, Tollymore Park, and Donard Demesne, 1885, Co. Down,—H. W. L.

214. Cantharellus lobatus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

215. Marasmius urens. *Fr.*

Donard Demesne, Co. Down, 1885.—H. W. L.

216. Marasmius perenatus. *Fr.*

Rademon, Co. Down, 1885.—H. W. L.

217. Marasmius oreades. *Fr.*

Derrytrasna, Co. Armagh, grass bank along roadside, 1883; Newcastle, Co. Down, abundant among the sandhills, 1885.—H. W. L. S. A. Stewart sent me specimens of this collected many years ago by him in the latter locality.

218. Marasmius erythropus. *Fr.*

Donard Demesne, Co. Down, abundant in upper part of the wood near the granite quarry; and Rademon, Co. Down, 1885.—H. W. L.

219. Marasmius rotula. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Rosstrevor Wood, 1883; and Rademon, 1885, Co. Down.—H. W L.

220. Marasmius androsaceus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

221. Lentinus tigrinus. *Fr.*

Ram's Island, Lough Neagh, 1884. Very rare.—H. W. L.

222. Lentinus flabelliformis. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

223. Boletus luteus. *L.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Raughlan, County Armagh; Killymoon, County Tyrone; and Donard Demesne, Co. Down, 1884. —H. W. L.

224. Boletus elegans. *Schum.*

Top of Knockbarragh Hill, 905 feet, Co. Down, 1883; Crawfordsburn, Co. Down, 1884; Tollymore Park, and Donard Demesne, County Down, 1885. Common.—H. W. L.

225. Boletus flavus. *With.*

Donard Demesne, Co. Down, 1883; wood at the Ferry Hill, near Omeath, Co. Louth, 1883; Killymoon, Co. Tyrone, 1884; Rademon, Co. Down, 1885. —H. W. L.

226. Boletus laricinus. *Berk.*

Tollymore Park, 1884, and Donard Demesne, 1885, Co. Down. Not common.—H. W. L.

227. Boletus granulatus. *L.*

Drumcro, near Maralin, County Down, 1884—U. H. Waddell. Donard Demesne, Co. Down, 1884; Tollymore Park, Co. Down, 1885.—H. W. L.

228. Boletus bovinus. *L.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Most abundant in heathy places in plantations of larch and Scotch fir, in Donard Demesne, and Tollymore Park, County Down, 1885.—H. W. L.

229. Boletus piperatus. *Bull.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

230. Boletus chrysenteron. *Fr.*

Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

231. Boletus subtomentosus. *L.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

232. Boletus variecolor. *B. and Br.*

Ardmore Glebe, Co. Armagh, 1884. Rare.—H. W. L.

233. Boletus pachypus. *Fr.*

Killymoon, Co. Tyrone, 1884; Rosstrevor Wood, Donard Demesne, and Tollymore Park, Co. Down, 1885. Common.—H. W. L.

234. Boletus edulis. *Bull.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Raughlan, County Armagh, 1883; Tollymore Park, and Donard Demesne, County Down, 1884; Rademon, Co. Down, 1885. Not common.—H. W. L.

235. Boletus fragrans. *Vitt.*

Ardmore Glebe, Co. Armagh, 1884. Very rare.—H. W. L.

236. Boletus impolitus. *Fr.*

Ardmore Glebe, Co. Armagh, 1883; Killymoon, Co. Tyrone, 1884; Tollymore Park, Co. Down, 1885.—H. W. L.

237. Boletus æstivalis. *Fr.*

In several plantations about Warrenpoint, Co. Down, 1883.—H. W. L.

238. Boletus satanas. *Lenz.*

Moira Demesne, and Donard Demesne, Co. Down, 1884. Rare.—H. W. L.

239. Boletus luridus. *Fr.*

Gillhall, Co. Down, 1883—C. H. Waddell. Ardmore, Co. Armagh, 1883; Killymoon, County Tyrone, and Tollymore Park, County Down, 1884. Rare.—H. W. L.

240. Boletus scaber. *Fr.*

In a plantation near the Vicarage, Warrenpoint, and Rosstrevor Wood, Co. Down, 1883; Raughlan, Co. Armagh, 1884; Donard Demesne, and Tollymore Park, Co. Down, 1885. Rather common.—H. W. L.

241. Boletus castaneus. *Bull.*

Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

242. Polyporus brumalis. *Fr.*

Raughlan Island, Co. Armagh, 1884.—H. W. L.

243. Polyporus lentus. *Berk.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

244. Polyporus perennis. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

245. Polyporus squammosus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Ardmore Glebe, and Raughlan, Co. Armagh, 1883; Killymoon, Co. Tyrone, 1884.—H. W. L.

246. Polyporus varius. *Fr.*

Tollymore Park, Co. Down, 1884.—C. H. Waddell.

247. Polyporus giganteus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Rosstrevor Wood, Co. Down, 1883.—C. H. Waddell. Langford Lodge, Co. Antrim, 1883.—H. W. L.

248. Polyporus salignus. *Fr.*

On a large willow, Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

249. Polyporus chioneus. *Fr.*

Killymoon, County Tyrone, 1884.—H. W. L.

250. Polyporus fumosus. *Fr.*

On a rotten stump, near the House, Narrow Water Demesne, Co. Down, 1883.—H. W. L.

251. Polyporus adustus. *Fr.*

On a gate post, near Derryadd Dispensary, Lurgan, Co. Armagh, 1883. —H. W. L.

252. Polyporus spumeus. *Fr.*

Killymoon, Co. Tyrone, 1884; Tollymore Park, County Down, 1885.—H. W. L.

253. Polyporus dryadeus. *Fr.*

Shane's Castle Park, Co. Antrim; and Tollymore Park, County Down; 1883.—H. W. L.

254. Polyporus betulinus. *Fr.*

Tollymore Park, Co. Down, 1884; Rademon, Co. Down, 1885.—H. W. L.

255. Polyporus pallescens. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

256. Polyporus fomentarius. *Fr.*

Lurgan Demesne, Co. Armagh, 1883; Loughrey, Co. Tyrone, 1884.—H. W. L. Portavoe, Co. Down, 1885.—J. B. A. Hughes. Rademon, County Down, 1885.—H. W. L.

257. Polyporus ignarius. *Fr.*

Drumcro, near Maralin; and Gilhall, County Down; 1883—C. H. Waddell. Ardmore, Co. Armagh, 1884.—H. W. L.

258. Polyporus fraxineus. *Fr.*

On the stump of a large ash tree, Killyglen, near Larne, County Antrim, 1884.—H. W. L.

259. Polyporus annosus. *Fr.*

Bangor, Co. Down, 1886; and Collin Glen, Co. Antrim, 1841.—W. Thompson. Narrow Water, 1883; Crawfordsburn, 1883; Belvoir Park, 1884; Donard Demesne, and Tollymore Park, 1885. Common in County Down.—H. W. L.

260. Polyporus radiatus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Rademon, County Down, 1885. Not common.—H. W L.

261. Polyporus fibula. *Fr.*

On the inside of the sash of a window, in the "prophet's chamber" of St. Patrick's House, Broughshane, Co. Antrim, 1883.—H. W. L.

262. Polyporus velutinus. *Fr.*

Holywood, Co. Down, 1841.—W. Thompson. Ardmore, Co. Armagh, 1883; Tollymore Park, Co. Down, 1885.—H. W. L.

263. Polyporus versicolor. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Cultra, Co. Down, 1835.—W. Thompson. Drumoro, near Maralin, County Down, 1883.—C. H. Waddell. Ardmore, Co. Armagh, 1883. Very common, and variable.—H. W. L.

264. Polyporus abietinus. *Fr.*

Rosstrevor Wood, Co. Down, 1883.—C. H. Waddell. Raughlan, County Armagh, 1884; Tollymore Park, Co. Down, 1885.—H. W. L.

265. Polyporus ferruginosus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

266. Polyporus violaceus. *Fr.*

On a dead Scotch fir at Raughlan, Co. Armagh, 1885.—H. W. L.

267. Polyporus purpureus. *Fr.*

On decayed willow trees; common throughout the parish of Montiaghs, or Ardmore, Co. Armagh, 1884.—H. W. L.

268. Polyporus medulla-panis. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. On the inside of the wooden cover of a well, Ardmore Glebe, Co. Armagh, 1883.—H. W. L.

269. Polyporus vulgaris. *Fr.*

Killymoon, County Tyrone, 1884.—H. W. L.

270. Polyporus vaporarius. *Fr.*

Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

271. Merulius corium. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

272. Merulius lacrymans. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

273. Fistulina hepatica. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Tollymore Park, Co. Down, 1883. Rare.—H. W. L.

274. Hydnum repandum. *L.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Wood at the Ferry Hill, near Omeath, Co. Louth, and Rosstrevor Wood, Co. Down, 1883; abundant in Donard Demesne, Co. Down, 1884.—H. W. L.

275. Hydnum graveolens. *Del.*

On an oak stump in Tollymore Park, County Down, 1884. Very rare.—H. W. L.

276. Irlex obliquus. *Fr.*

Warrenpoint, Co. Down, 1883; Ardmore Glebe, County Armagh, 1884.—H. W. L.

277. Radulum orbiculare. *Fr.*

Rosstrevor Wood, County Down, on dead hazel, 1883.—C. H. Waddell.

278. Grandinia granulosa. *Fr.*

Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

279. Craterellus cornucopioides. *Fr.*

Rosstrevor Wood, 1883, and Donard Demesne, 1885, Co. Down.—H. W. L.

280. Craterellus sinuosus. *Fr.*

Donard Demesne, Co. Down, 1884.—H. W. L.

281. Thelephora cristata. *Fr.*

On beech leaves near the grotto in Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

282. Thelephora mellissima. *P.*

Rademon, Co. Down, 1885.—H. W. L.

283. Thelephora laciniata. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

284. Thelephora cæsia. *P.*

Hillsborough Demesne, County Down, 1883.—H. W. L.

285. Stereum purpureum. *Fr.*

Near Belfast, Templeton (*Thelephora purpurea*), Ann. Nat. Hist., Vol. V. Raughlan, County Armagh, 1884.—H. W. L.

286. Stereum hirsutum. *Fr.*

Near Belfast, Templeton (*Thelephora hirsuta*), Ann. Nat. Hist., Vol. V. Ardmore, Co. Armagh, 1882; Killymoon, Co. Tyrone, 1884; Maralin, 1884, and Rademon, and Donard Demesne, County Down, 1885.—H. W. L.

287. Stereum sanguinolentum. *Fr.*

Donard Demesne, Co. Down, 1885, on stump of larch, and felled Scotch firs. Not common.—H. W. L.

288. Hymenochaete rubiginosa. *Lev.*

Near Belfast, Templeton (*Thelephora rubiginosa*), Ann. Nat. Hist., Vol. V. Raughlan, Co. Armagh, 1884; Killymoon, Co. Tyrone, 1884; Rademon, Co. Down, 1885.—H W. L.

289. Corticium evolvens. *Fr.*

Rosstrevor Wood, Co. Down, 1883.—H. W. L.

290. Corticium arachnoideum. *Berk.*

Holywood House, Co. Down, 1841.—W. Thompson. Killymoon, County Tyrone, 1884.—H. W. L.

291. Corticium læve. *Fr.*

Cultra, and Bangor, Co. Down, 1835.—W. Thompson. Caledon Demesne, and Killymoon, Co. Tyrone, 1884; Ardmore, Co. Armagh, 1884; Donard Demesne; and Tollymore Park, County Down; 1885.—H. W. L.

292. Corticium velutinum. *Fr.*

The Oaks, Co. Derry, 1842.—G. Lyle. Stranmillis, near Belfast, 1885. —S. M. Malcomson. Raughlan, Co. Armagh, 1885.—H. W. L.

293. Corticium cæruleum. *Fr.*

Near Belfast, Templeton (*Thelephora cærulea*), Ann. Nat. Hist., Vol. V.

294. Corticium calceum. *Fr.*

Near Belfast, Templeton (*Thelephora calcea*), Ann. Nat. Hist., Vol. V. Stranmillis, near Belfast, 1884.—S. M. Malcomson.

295. Corticium quercinum. *P.*

On decayed beech, Warrenpoint, Co. Down, 1883.—C. H. Waddell.

296. Corticium nudum. *Fr.*

Bark of laurel, Sydenham, Co. Down, 1883.—W. H. Patterson. Rosstrevor Wood, Co. Down, 1883.—H. W. L.

297. Corticium confluens. *Fr.*

Near Belfast, Templeton (*Thelephora epidermea, Pers*), Ann. Nat. Hist., Vol. V. Ardmore Glebe, Co. Armagh, 1885.—H. W. L.

298. Corticium comedens. *Fr.*

On a decayed oak branch, Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

299. Corticeum lacteum. *Fr.*

Near Belfast, Templeton (*Himantia candida*), Ann. Nat. Hist., Vol. V.

300. Sparassis laminosa.

On the occasion of the first Fungus Foray in Ireland, to Shane's Castle, Co. Antrim, 1883, I found an immense *Sparassis* growing on the stump of an old oak near the ruins. It resembled a huge cauliflower, and was more plaited than *S. crispa*, as figured in Cooke's Handbook, and by Berkeley in Intellectual Observer. If not *S. laminosa*, it comes very near it.—H. W. L.

301. Clavaria fastigiata. *D. C.*

Near Belfast, Templeton (*Clavaria pratensis*), Ann. Nat. Hist., Vol. V. Rademon, Co. Down, 1885.—H. W. L.

302. Clavaria coralloides. *L.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Very abundant in Shane's Castle Park, Co. Antrim, 1883; Killymoon, County Tyrone, 1884; Donard Demesne, Co. Down, 1885.—H. W. L.

303. Clavaria cinerea. *Bull.*

Very abundant in the woods of Killymoon, Co. Tyrone, 1884.—H. W. L.

304. Clavaria rugosa. *Bull.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Shane's Castle Park, Co. Antrim, abundant, 1883; Donard Demesne, Co. Down, 1884.—H. W. L.

305. Clavaria fusiformis. *Sow.*

Near the waterfall, opposite the Ferry at Narrow Water, on County Louth side; and Ardmore Glebe, Co. Armagh; 1883.—H. W. L.

306. Clavaria inæqualis. *Müll.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

307. Clavaria vermiculata. *Scop.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Drumcro, near Maralin, Co. Down, 1884.—C. H. Waddell.

308. Clavaria fragilis. *Holmsk.*

Slieve Donard, Co. Down, at 1100 feet, 1884; Donard Demesne, and Rademon, Co. Down, 1885.—H. W. L.

309. Clavaria pistillaris. *L.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

310. Clavaria tuberosa. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

311. Clavaria cornea. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

312. Typhula erythropus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

313. Pistillaria micans. *Fr.*

Ardmore Glebe, Co. Armagh, 1888.—H. W. L.

314. Pistillaria puberula. *Berk.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

315. Tremella fimbriata. *P.*

Ardmore Glebe, Co. Armagh, 1888.—H. W. L.

316. Tremella foliacea. *P.*

Near Londonderry, 1883.—G. V. Craig. Ardmore Glebe, Co. Armagh, 1888; Rademon, Co. Down, 1885.—H. W. L.

317. Tremella mesenterica. *Retz.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Maralin, Co. Down, 1888.—C. H. Waddell. Ardmore Glebe, County Armagh; Killymoon, County Tyrone, 1884; Rademon, Co. Down, 1885.—H. W. L.

318. Tremella albida. *Huds.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Ardmore, County Armagh, 1883; Killymoon, Co. Tyrone, and Rosstrevor Wood, Co. Down, 1884; Tollymore Park, Co. Down, 1885.—H. W. L.

319. Tremella intumescens. *Sow.*

Portavoe, Co. Down, 1884.—J. B. A. Hughes.

320. Hirneola auricula-judæ. *Berk.*

On very old and large elder trees inside the ruins of Maghera Church, near Newcastle, 1884; and Donard Demesne, Co. Down, 1885.—H. W. L.

321. Nematelia encephala. *Fr.*

On a black alder stump, Raughlan, County Armagh, 1884. Very rare.—H. W. L.

322. Dacrymyces stillatus. *Nee.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Ardmore, County Armagh; Tollymore Park; and Donard Demesne, Co. Down; 1885. Common.—H. W. L.

323. Phallus impudicus. *Linn.*

Castledawson Demesne, Co. Derry.—S. A. Stewart. Near Holywood, Co. Down, 1883.—R. L. Praeger. Killymoon, Co. Tyrone, 1883; Tollymore Park; and sandhills near Newcastle, Co. Down; 1885. Not common.—H. W. L.

324. Bovista nigrescens. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Ardmore Glebe, Co. Armagh, 1882; Killymoon, Co. Tyrone, 1883. Rare.—H. W. L.

325. Bovista plumbea. *P.*

I found one specimen among the sandhills, near Newcastle, Co. Down, in October, 1884. Rare.—H. W. L.

326. Lycoperdon giganteum. *Batsch.*

Shane's Castle Park, Co. Antrim, 1883.—H. W. L. This species is not common in the district. I heard of a large specimen found near Belfast, in 1884, that was exhibited in a seedsman's window in that town; and in September, 1885, one was sent to me weighing 8 lbs., and measuring 3 ft. 10 in. in girth. It grew in Belvoir Park, Co. Down.

327. Lycoperdon ocellatum. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Rademon, and Donard Demesne, County Down, 1885.—H. W. L.

328. Lycoperdon pusillum. *Fr.*

Killymoon, Co. Tyrone, 1884. Not common.—H. W. L.

329. Lycoperdon saccatum. *Vahl.*

Ardmore Glebe, Co. Armagh, 1883; Moira Demesne, Co. Down, 1884.—H. W. L.

330. Lycoperdon gemmatum. *Fr.*

Near the Ness Waterfall, Co. Derry, 1842.—W. Thompson. Raughlan, and Ardmore, Co. Armagh, 1883; Rademon, Tollymore Park, and Donard Demesne, County Down, 1885. Common..—H. W. L.

331. Lycoperdon pyriforme. *Schaff.*

Rosstrevor Wood, Co. Down, 1883; Killymoon, Co. Tyrone, and Ardmore Glebe, Co. Armagh, 1884; Tollymore Park, Co. Down, 1885.—H. W. L.

332. Scleroderma vulgare. *Fr.*

Narrow Water Demesne, Co. Down, and Shane's Castle Park, County Antrim, 1883; Ardmore, Co. Armagh, Killymoon, Co. Tyrone, and Donard Demesne, Co. Down, 1885. Common.—H. W. L.

333. Scleroderma bovista. *Fr.*

Near Belfast, 1884.—J. J. Andrew.

334. Lycogala epidendrum. *Fr.*

Ardmore, Co. Armagh, 1883.—H. W. L. By the Lagan's banks, near Belfast, 1885.—S. M. Malcomson.

335. Ethalium septicum. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

336. Spumaria alba. *D. C.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. This curious plant closely resembles the droppings of some bird lying on moss or grass. Donard Demesne, Co. Down, 1885.—H. W. L.

337. Didymium farfaceum. *Fr.*

Killymoon, County Tyrone, 1884.—H. W. L.

338. Didymium melanopus. *Fr.*

Donard Demesne, Co. Down, 1884.—H. W. L.

339. Physarum cinerum.

Mr. W. B. Grove so named a plant on bark of decayed holly from Rosstrevor Wood, Co. Down, 1885.—H. W. L.

340. Didymium physaroides. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

341. Angioridium sinuosum. *Grev.*

Near Belfast, Templeton, (*Physarum sinuosum*), Ann. Nat. Hist., Vol. V.

342. Craterium minutum. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Maralin, County Down, 1884.—C. H. Waddell.

343. Stemonitis fusca. *Roth.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Warrenpoint, Co. Down, 1883.—C. H. Waddell.

344. Stemonitis typhoides. *D. C.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

345. Stemonitis ovata. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

346. Dictydium umbilicatum. *Schrad.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

347. Arcyria incarnata. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Errigle, County Cavan, 1884.—T. H. Moorhead. Ardmore, Co. Armagh, 1883.—H. W. L.

348. Arcyria nutans. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

349. Trichia chrysosperma. *D. C.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

350. Trichia varia. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

351. Trichia serpula. *P.*

Purdysburn, Co. Down, 1885.—S. M. Malcomson.

352. Perichæna populina. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

353. Licea cylindrica. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

354. Licea fragiformis. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

355. Cyathus striatus. *Hoffm.*

Near Belfast, 1875.—W. H. Patterson.

356. Crucibulum vulgare. *Tul.*

Near Belfast, Templeton (*Nidularia crucibulum, Pers.*), Ann. Nat. Hist., Vol. V.

357. Sphærobolus stellatus. *Tode.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

358. Phoma concentricum. *Desm.*

On leaves of *Yucca*, Raughlan, Co. Armagh, 1884.—H. W. L.

359. Sphæropsis taxi. *Berk.*

Near Belfast, Templeton (*Sphæria Taxi, Sow.*), Ann. Nat. Hist., Vol. V.

360. Diplodia ilicis. *Curr.*

Near Belfast, Templeton (*Sphæria ilicis, Schleich*), Ann. Nat. Hist., Vol. V.

361. Stagonospora pini.

This new species was collected at Raughlan, Co. Armagh, 1883. The description is given in a paper by W. B. Grove on "New or Noteworthy Fungi," in *Journal of Botany*, 1885:—"Perithecia epiphyllis, tectis, sparsis, rotundatis, atris; sporulis pallide luteolis, singulis hyalinis, cylindraceo-fusoides, utrinque subobtusis, 1 dein 3 septatis, 16—20 μ x 3—4 μ. In foliis Pini Sylvestris. Hibernia, H. W. Lett, August."

362. Septoria castanæcola. *Desm.*

Warrenpoint Vicarage, 1883; Tollymore Park, County Down, 1884.—H. W. L.

363. Ascochyta dianthi. *Berk.*

Ardmore Glebe, Co. Armagh, 1883; Warrenpoint, County Down, 1884.—H. W. L.

364. Asteroma reticulatum. *Berk.*

Ardmore Glebe, Co. Armagh, 1883.—H. W. L.

365. Rabenhorstia tiliæ. *Fr.*

Near Belfast, Templeton (*Sphæria tiliæ, Pers.*), Ann. Nat. Hist., Vol. V.

366. Discella carbonacea. *Fr.*

On dead twigs of *Golden Willow*, in Ardmore Churchyard, Co. Armagh, 1884.—H. W. L.

367. Coniothecium lauri. *Grev.*

Desertcreat, Co. Tyrone, 1883.—H. W. L.

368. Melanconium bicolor. *Nees.*

Raughlan, Co. Armagh, 1884.—H. W. L.

369. Coryneum disciforme. *Kze.*

Drumcro, near Maralin, County Down, 1883.—C. H. Waddell.

370. Phragmidium mucronatum. *Link.*

Near Belfast, Templeton (*Aregma mucronatum, F.*), Ann. Nat. Hist., Vol. V. Errigle, Co. Cavan, 1884.—T. H. Moorhead. Near Strabane, Co. Tyrone, 1883; Ardmore, Co. Armagh, 1884. Common.—H. W. L.

371. Phragmidium bulbosum. *Schl.*

Near Belfast, Templeton (*Uredo ruborum* and *Aregma bulbosum*), Ann. Nat. Hist., Vol. V. Errigle, Co. Cavan, 1884.—T. H. Moorhead. Warrenpoint, Co. Down; Ardmore, County Armagh; 1883.—H. W. L.

372. Phragmidium gracile. *Grev.*

Collin Glen, Co. Antrim, 1886.—W. Thompson. Errigle, Co. Cavan.—T. H. Moorhead. Ardmore, Co. Armagh, 1883.—H. W. L.

373. Phragmidium obtusum. *Link.*

Uredo spores on *Potentilla reptans*, near Strabane, 1883; and Loughrey, Co. Tyrone, 1884.—H. W. L.

374. Triphragmium ulmariæ. *Link.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Ardmore, Co. Armagh, 1883; banks of the Lagan, near Belfast, Co. Antrim, 1885.—H. W. L.

375. Puccinia graminis. *P.*

Near Belfast, Templeton (*Uredo rubigo*), Ann. Nat. Hist., Vol. V. Near Belfast.—W. Thompson. Errigle, County Cavan, 1884.—T. H. Moorhead. Drumcro, near Maralin, County Down, 1883.—C. H. Waddell. Ardmore, Co. Armagh, 1883. Common.—H. W. L.

376. Puccinia arundinacea. *Hedw.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. On reeds in Closet River, at Raughlan, County Armagh; Bog Meadows, near Belfast, 1885.—H. W. L.

377. Puccinia striola. *Link.*

Balmoral, near Belfast, Co. Antrim, 1885.—S. M. Malcomson.

378. Puccinia coronata. *Corda.*

Banks of the Lagan, near Belfast, 1884.—J. J. Andrew.

379. Puccinia glechomatis. *D. C.*

Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

380. Puccinia menthæ. *P.*

Near Belfast, Templeton (*Uredo labiatarum*), Ann. Nat. Hist., Vol. V. Errigle, Co. Cavan, 1884.—T. H. Moorhead. Drumcro, near Maralin, County Down, 1883.—C. H. Waddell. Warrenpoint, Co. Down; and Ardmore, Co. Armagh; 1883.—H. W. L.

381. Puccinia compositarum. *Sch.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Ardmore, Co. Armagh, 1884; Banks of the Lagan, near Belfast.—H. W. L.

382. Puccinia glomerata. *Grev.*

Near Belfast, Templeton (*Uredo senecionis*), Ann. Nat. Hist., Vol. V. Warrenpoint, Co. Down; Ardmore, Co. Armagh; Bog Meadows, near Belfast, Co. Antrim; 1884.—H. W. L.

383. Puccinia variabilis. *Grev.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Clandeboy, and Ballylesson, Co. Down; Ardmore Glebe, Co. Armagh; 1884.—H. W. L.

384. Puccinia glomerata. *Link.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead.

385. Puccinia umbelliferarum. *D. C.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Middletown, Co. Armagh (on *Hydrocotyle*).—C. H. Waddell. Ardmore, Co. Armagh; very abundant on *Sium latifolium*; 1884.—H. W. L.

386. Puccinia ægopodi. *Link.*

Near Belfast, Templeton (*Sphæria ægopodii*), Ann. Nat. Hist., Vol. V. Ardmore, Co. Armagh, 1883.—H. W. L.

387. Puccinia saniculæ. *Grev.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead.

388. Puccinia smyrnii. *Corda.*

Ardmore Glebe, Co. Armagh, 1883; Crawfordsburn, County Down, 1884. —H. W. L.

389. Puccinia anemones. *P.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead.

390. Puccinia violarum. *Link.*

Near Belfast, Templeton (*Uredo violarum*, *D. C.*), Ann. Nat. Hist., Vol. V. Errigle, Co. Cavan, 1884.—T. H. Moorhead. Ardmore Glebe, Co, Armagh, 1884.—H. W. L.

391. Puccinia lychnidearum. *Link.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead.

392. Puccinia umbilici. *Gaep.*

Near Strabane, County Tyrone, 1883.—H. W. L.

393. Puccinia epilobii. *D. C.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

394. Puccinia circeæ. *P.*

Shane's Castle Park, Co. Antrim, 1883. Rare.—H. W. L.

395. Puccinia fabæ. *Link.*

Warrenpoint, Co. Down, 1883.—H. W. L.

396. Puccinia fallens. *Cooke.*

Near Belfast, Templeton (*Uredo leguminosarum*), Ann. Nat. Hist., Vol. V. Warrenpoint, Co. Down; and Ardmore, County Armagh; 1883—H. W. L.

397. Puccinia buxi. *D. C.*

Wolfhill, near Belfast, 1842.—W. Thompson. Errigle, County Cavan, 1884.—T. H. Moorhead. Ardmore Glebe, Co. Armagh, 1885.—H. W. L.

398. Puccinia hieracii. *Mart.*

Crawfordsburn, Co. Down, 1884.—H. W. L. For description see M. C. Cooke's "Micro Fungi," 4th edit., p. 207.

399. Puccinia segra. *Grove.*

Drumcro, near Maralin, Co. Down, 1883.—C. H. Waddell. Warrenpoint Vicarage Garden, 1883.—H. W. L. For description see *Journal of Botany*, September, 1883.

400. Puccinia malvaceærum. *Cor.*

See Grevilles, vol. ii. pp. 47 and 137. Carlingford, County Louth, on mallow; Ardmore, Co. Armagh, on mallow and hollyhock; 1883.—H. W. L.

401. Gymnosporangium juniperi. *Lk.*

I found a specimen of this on grass under fir trees in the Fort Grove, near Moira Rectory, Co. Down, July, 1884. Rare.—H. W. L.

402. Podisoma juniperi. *Fr.*

Near Belfast, Templeton (*Podisoma juniperi-sabinæ*), Ann. Nat. Hist., Vol. V. Wolfhill, Belfast, County Antrim, on upright juniper, 1837.—W. Thompson.

403. Tilletia caries. *Tul.*

Near Belfast, Templeton (*Uredo caries, D. C.*), Ann. Nat. Hist., Vol. V.

404. Ustilago carbo. *Tul.*

Near Belfast, Templeton (*Uredo segetum, P.*), Ann. Nat. Hist., Vol. V. Errigle, Co. Cavan, 1884.—T. H. Moorhead. Drumcro, near Maralin, County Down, 1883.—C. H. Waddell. Ardmore, Co. Armagh, 1883. Very common on ears of oats.—H. W. L.

405. Urocystis pompholygodes. *Schlecht.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Ardmore Glebe, County Armagh, 1884, on *Ranunculus repens* and *acris*. Common.—H. W. L.

406. Uromyces appendiculata. *Lev.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead.

407. Uromyces apiculosa. *Lev.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead.

408. Uromyces ficariæ. *Lev.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead.

409. Uromyces intrusa. *Lev.*

Carr's Glen, near Belfast, Co. Antrim, 1885.—S. M. Malcomson. Collin Glen, Co. Antrim, 1882.—H. W. L.

410. Uromyces concentrica. *Lev.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Banks of the Lagan, near Belfast, Co. Antrim, 1885.—S. M. Malcomson.

411. Coleosporium tussilaginis. *Lev.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Clonallon, Co. Down; and Ardmore, Co. Armagh; 1883. Very common.—H. W. L.

412. Coleosporium petasites. *Lev.*

Clonallon, Co. Down, 1883.—H. W. L.

413. Coleosporium sonchi-arvensis. *Lev.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Warrenpoint Vicarage, Co. Down, 1883.—H. W. L.

414. Coleosporium rhinanthacearum. *Lev.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Fortwilliam, near Moira, Co. Down, 1883,—C. H. Waddell.

415. Melampora salicina. *Lev.*

On *Salix viminalis*, Ardmore, Co. Armagh, 1883.—H. W. L.

416. Melampora betulina. *Desm.*

Ballyvalley, Co. Down, 1883.—C. H. Waddell.

417. Melampora euphorbiæ. *Cast.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Near Newcastle, Co. Down, 1884.—H. W. L.

418. Cystopus candidus. *Lev.*

Near Belfast, Templeton (*Uredo candida*, *P.*), Ann. Nat. Hist., Vol. V. Errigle, Co. Cavan, 1884.—T. H. Moorhead. Warrenpoint, Co. Down; Ardmore, Co. Armagh; 1883. Very common.—H. W. L.

419. Uredo potentillarum. *D. C.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Loughrey, Co. Tyrone; side of the Lagan, near Belfast, on "Barren Strawberry" (*Potentilla fragariastrum*); 1885.—H. W. L.

420. Uredo hypericorum. *D. C.*

Donard Demesne, Co. Down, 1885.—G. Pim, and H. W. L.

421. Uredo vacciniorum. *P.*

Slieve Donard, Co. Down, 1883.—H. W. L.

422. Uredo bifrons. *Grev*

Errigle, Co. Cavan, 1884.—T. H. Moorhead.

423. Trichobasis petroselini. *B.*

Abundant on *Smyrnium olusatri*, at Ardmore Glebe, Co. Armagh, 1884. —H. W. L.

424. Trichobasis suaveolens. *Lev.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Bank of the Lagan, near Belfast, 1885.—S. M. Malcomson. Analoist, Co. Armagh; and Warrenpoint, Co. Down; 1883. Common.—H. W. L.

425. Trichobasis rumicum. *D. C.*

For description see M. C. Cooke's "Rust, Smut, and Mildew," 4th edit. p. 225. Near Belfast, 1884.—J. J. Andrew.

426. Lecythea lini. *Lev.*

Near Belfast, Templeton (*Uredo lini*, *D. C.*), Ann. Nat. Hist., Vol. V. Shore of Lough Neagh, at Ardmore Glebe, Co. Armagh, 1883.—H. W. L.

427. Roestelia lacerata. *Tul.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Derryloist, Co. Armagh, 1884.—H. W. L.

428. Æcidium epilobii. *D. C.*

Banks of the Lagan, near Belfast, 1885.—S. M. Malcomson.

429. Æcidium euphorbiæ. *P.*

Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

430. Æcidium berberidis. *P.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead.

431. Æcidium crassum var. periclymeni. *D. C.*

Errigle, Co, Cavan, 1884.—T. H. Moorhead. Near Shaw's Bridge, on the Lagan, Co. Antrim, 1885.—S. M. Malcomson.

432. Æcidium ranunculacearum. *D. C.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Ardmore, Co. Armagh; Balmoral, near Belfast, Co. Antrim, 1883. Common.—H. W. L.

433. Æcidium grossulariæ. *D. C.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Errigle, County Cavan, 1884.—T. H. Moorhead. Ardmore Glebe, Co. Armagh, 1882. Very common.—H. W. L.

434. Æcidium urticæ. *D. C.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Ardmore, Co. Armagh, 1885. Not common.—H. W. L.

435. Æcidium taraxaci. *K. et Schm.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Near Belfast, 1884.—J. J. Andrew. Ardmore, Co. Armagh, 1884.—H. W. L.

436. Æcidium compositarum var. tussilaginis. *P.*

Ardmore, Co. Armagh; Ormeau, and Newcastle, County Down; 1885.—H. W. L.

437. Æcidium compositarum var. jacobeæ. *Grev.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Near Belfast, 1884.—J. J. Andrew.

438. Æcidium primulæ. *D. C.*

By the side of the Lagan, near Belfast, 1885.—S. M. Malcomson.

439. Æcidium rubellum. *P.*

Banks of the Lagan, near Belfast, 1884.—J. J. Andrew.

440. Æcidium ari. *Berk.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead.

441. Æcidium allii. *Grev.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead.

442. Ceratium hydnoides. *A. and S.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

443. Stilbum bicolor. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

444. Stilbum vulgare. *Tode.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

445. Mystrosporium stemphylium. *Corda.*

On ripe seed vessels of garden Wallflower, Warrenpoint Vicarage, County Down, 1883. (The fig. in Cooke's Handbook, p. 578, does not appear to belong to this species.)—H. W. L.

446. Cladosporium herbarum. *Lk.*

On dead cabbage leaf, Ardmore, Co. Armagh, 1884.—H. W. L.

447. Cladosporium compactum. *Secc.*

Mr. W. B. Grove considers some specimens on ripe garden pea pods, from Warrenpoint Vicarage, Co. Down, 1883, are to be referred to this species.—H. W. L.

448. Aspergillus glaucus. *Lk.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Common everywhere on decaying bread, cheese, jam, &c.—H. W. L.

449. Aspergillus candidus. *Lk.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Ardmore Glebe, County Armagh, 1883. On berries of *Tamus communis*, old kid gloves, and fruit stones, 1884.—H. W. L.

450. Peronospora infestans. *Mont.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Common everywhere; in some seasons much later than others in making its appearance on the potato crop, as in 1885.—H. W. L.

451. Peronospora nivea. *Unq.*

On hogweed (*Ægopodium podagra*), Warrenpoint, Co. Down, 1883.—H. W. L.

452. Peronospora gangliformis. *Berk.*

On groundsel leaves, Warrenpoint, Co. Down, 1883.—H. W. L.

453. Peronospora candida. *Fekl.*

Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

454. Polyactis cana. *Berk.*

On a dead strawberry leaf, Ardmore Glebe Garden, Co. Armagh, 1884.—H. W. L.

455. Polyactis vera. *Berk.*

Near Belfast, Templeton (*Botrytis vera.* Fr.), Ann. Nat. Hist., Vol. V.

456. Stysanus stemonitis. *Corda.*

Tollymore Park, County Down, 1885.—G. Pim, and H. W. L.

457. Monilia racemosa. *Pers.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

458. Sepedonium chrysospermum. *Lk.*

Near Belfast, Templeton (*Strachylidium diffusum.* Fr.), Ann. Nat. Hist., Vol. V. On decaying Boleti, especially *Boletus pachypus*, Gilhall, Co. Down, 1883.—C. H. Waddell. Donard Demesne, and Tollymore Park, County Down, 1884. Common.—H. W. L.

459. Mucor mucedo. *L.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. On paste, jam, &c. Very common everywhere.—H. W. L.

460. Mucor caninus. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

461. Mucor amethysteus. *Berk.*

Ardmore, Co. Armagh, on rotting pears, 1883.—H. W. L.

462. Pilobolus crystallinus. *Tode.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

463. Onygena equina. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

464. Microsphæria berberidis. *Lev.*

Finnebrogue, Co. Down, 1885, on barberry leaves.—H. W. L.

465. Microsphæria grossulariæ. *Lev.*

Drumcro, near Maralin, County Down, 1883.—C. H. Waddell. Ardmore Glebe, Co. Armagh, very abundant in autumn of 1885.—H. W. L.

466. Erysiphe martii. *Lk.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Ardmore, Co. Armagh, and Warrenpoint, County Down, 1883.—H. W. L.

467. Erysiphe montagnei. *Lev.*

Ardmore, Co. Armagh, 1884, on burdock (*Arctium lappa*) leaves.—H. W. L.

468. Eurotium herbariorum. *Lk.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Ardmore, County Armagh, 1882. Common.—H. W. L.

469. Helvella crispa. *Fr.*

Drumcro, near Maralin, County Down, 1883.—C. H. Waddell. Ardmore Glebe, Co. Armagh, 1883.—H. W. L.

470. Helvella lacunosa. *Afz.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

471. Mitrula paludosa. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Slieve Donard, Co. Down, 1885.—S. M. Malcomson. Mountain near Hilltown, Co. Down, 1885, on dead heather (*Calluna vulgaris*) in water.—H. W. L.

472. Leotia lubrica. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

473. Geoglossum glabrum. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

474. Peziza venosa. *P.*

On a gravelled walk, Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

475. Peziza badia. *P.*

Warrenpoint Vicarage, Co. Down. 1883 Killymoon, Co. Tyrone. 1884.—H. W. L.

476. Peziza cochleata. *Huds.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

477. Peziza leporina. *Batsch.*

Killymoon, County Tyrone, 1884. Very rare.—H. W L

478. Peziza aurantia. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V

479. Peziza vesiculosa. *Bull.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

480. Peziza humosa. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

481. Peziza granulata. *Bull.*

Drumcro, near Maralin, County Down, 1883.—C. H. Waddell. Killymoon, Co. Tyrone; Ardmore, Co. Armagh; Ormeau Park, Co. Down; 1884. Very common.—H. W. L.

482. Peziza coccinea. *Jacq.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. This is mentioned in Harris's Down as having been found at Kilwarlin, near Hillsborough. Ardmore Glebe Garden, Co. Armagh, 1884. Rare.—H. W. L.

483. Peziza brunnea. *A. and S.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Banks of the Lagan, near Belfast, 1885.—S. M. Malcomson.

484. Peziza trechispora. *B. and Br.*

Near Ardmore Church, Co. Armagh, 1885. Not common.—H. W. L.

485. Peziza scutellata. *L.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

486. Peziza stercorea. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Ardmore, Co. Armagh, 1884.—H. W. L.

487. Peziza virginea. *Batsch.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Ardmore, County Armagh, on dead twigs of lime tree, 1884.—H. W. L.

488. Peziza nivea. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

489. Peziza calycina. *Schum.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Warrenpoint, Co. Down, 1883, on a fir tree.—H. W. L.

490. Peziza papillaris. *Bull.*

Near Belfast, Templeton (*Peziza papillata.* P.), Ann. Nat. Hist., Vol. V.

491. Peziza villosa. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

492. Peziza inflexa. *Bolt.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

493. Peziza cinerea. *Batsch.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Sallagh Braes, near Larne, Co. Antrim, 1884, on rotten wood.—H. W. L.

494. Peziza fusaroides. *Berk.*

Near Belfast, Templeton (*Fusarium tremelloides.* Grev.), Ann. Nat. Hist., Vol. V.

495. Helotium æruginosum. *Fr.*

Shane's Castle Park, County Antrim, 1883; Killymoon, Co. Tyrone, and Rosstrevor Wood, County Down, 1884; Tollymore Park, County Down, 1885. The stained wood is common; while the fully developed *Helotium* is rare, except in the last locality, where I found it in abundance, October, 1885.—H. W. L.

496. Helotium calyculus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

497. Helotium citrinum. *Fr.*

Near Belfast, Templeton (*Peziza citrina.* Hedw.), Ann. Nat. Hist., Vol. V.

498. Helotium lenticulare. *Fr.*

Near Belfast, Templeton (*Peziza lenticularis.* Bull), Ann. Nat. Hist., Vol. V.

499. Helotium rhizophilum. *Fckl.*

By the side of the Bloody Burn, Slieve Donard, Co. Down, 1885.—H. W. L.

500. Helotium aciculare.

Near Belfast, Templeton (*Peziza acicularis.* Bull), Ann. Nat. Hist., Vol. V.

501. Patellaria atrata. *Fr.*

Lurgan Demesne, and Ardmore Glebe, Co. Armagh, 1883; Killymoon, Co. Tyrone, 1884. Common.—H. W. L.

502. Patellaria lecideola. *Fr.*

Sallagh Braes, near Larne, Co. Antrim, 1884.—H. W. L.

503. Ascobolus furfaceus. *P.*

Ardmore, Co. Armagh; Killymoon, County Tyrone, 1884. Common.—H. W. L.

504. Bulgaria inquinans. *Fr.*

Lurgan Demesne, Co. Armagh, 1883; Killymoon, Co. Tyrone, 1884. Abundant.—H. W. L.

505. Bulgaria sarcoides. *Fr.*

Near Belfast, Templeton (*Tremella sarcoides.* With.), Ann. Nat. Hist., Vol. V. Greyabbey, County Down, 1883.—R. L. Praeger. Narrow Water Demesne, 1883; Rademon, and Tollymore Park, Co. Down, 1885.—H. W. L.

506. Elaphomyces variegatus. *Vitt.*

Donard Demesne, Co. Down, under beech trees near the Spa Cottage, 1885.—H. W. L.

507. Elaphomyces granulatus. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

508. Phacidium coronatum. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist, Vol. V.

509. Phacidium ilicis. *Fr.*

Warrenpoint and Rosstrevor, Co. Down, 1883; Ardmore, Co. Armagh, 1883. Common.—H. W L.

510. Heterosphæria patella. *Grev.*

Loughrey, Co. Tyrone, 1884; Sallagh Braes, near Larne, County Antrim, 1884; Ardmore, County Armagh, 1884.—H. W. L.

511. Rhytisma acerinum. *Fr.*

Near Belfast, Templeton, Ann. Hist., Vol. V. Ardmore, Co. Armagh; Killymoon, Co. Tyrone; Maralin, Warrenpoint, Donard Demesne, and Tollymore Park, Co. Down, 1883. Very common and abundant wherever there are sycamore trees.—H. W. L.

512. Hysterium pulicare. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

513. Hysterium fraxini. *P.*

Near Belfast, Templeton, Ann. Nat. Hist Vol. V. Killymoon, County Tyrone, on ash twigs, 1884.—H. W. L.

514. Hysterium (Hypoderma) virgultorum. *D. C.*

Near Belfast, Templeton (*Hysterium rubi.* P.), Ann. Nat. Hist., Vol. V.

515. Hysterium (Hypoderma) hederæ. *De Not.*

Sallagh Braes, near Larne, Co. Antrim, 1884; Ardmore Glebe, County Armagh, 1885. Not common.—H. W. L.

516. Hysterium (Hypoderma) conigenum. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

517. Hysterium (Lophodermium) pinastri. *Schrad.*

Near Belfast, Templeton, Ann. Nat. Hist, Vol. V.

518. Hysterium (Lophodermium) juniperinum. *D. N.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

519. Stegia ilicis.

Errigle, Co. Cavan, 1884.—T. H. Moorhead. Ardmore, Co. Armagh, 1882; Warrenpoint, Co. Down, 1883; Killymoon, Co. Tyrone, 1884; Donard Demesne, and Tollymore Park, Co. Down, 1884.—H. W. L.

520. Trochila lauro-cerasi. *Fr.*

Desertcreat, Co. Tyrone, 1883; Tollymore Park, County Down, 1884.—H. W. L.

521. Trochila buxi. *Capron.*

Ardmore Glebe, Co. Armagh. I have found this only on dead leaves that have not fallen.—H. W. L.

522. Trochila craterium. *Fr.*

Ardmore, Co. Armagh, 1885.—H. W. L.

523. Torrubia militaris. *Fr.*

Near Belfast, Templeton (*Sphæria militaris.* Fl. Dan.), Ann. Nat. Hist., Vol. V. Near Clonallon Church, Co. Down, 1883.—H. W. L.

524. Epichloe typhina. *Berk.*

Near Belfast, Templeton (*Dothidea typhina.* P.), Ann. Nat. Hist., Vol. V. The Oaks, Co. Derry, 1842,—G. Lyle. Ardmore, County Armagh, 1883.—H. W. L.

525. Hypocrea farinosa. *B. and Br.*

Killymoon, County Tyrone, 1884.—H. W. L.

526. Hypomyces aurantia. *Tul.*

Near Belfast, Templeton (*Sphæria aurantia.* P.), Ann. Nat. Hist., Vol. V.

527. Nectria cinnabarina. *Fr.*

Near Belfast, Templeton (*Sphæria fragiformis*), Ann. Nat. Hist., Vol. V. Warrenpoint, and Ormeau, Co. Down; Ardmore Glebe, Co. Armagh; Killymoon, Co. Tyrone, 1884. Very common everywhere.—H. W. L.

528. Nectria coccinea. *Fr.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V. Cave Hill, County Antrim, 1843.—W. Thompson. Errigle, Co. Cavan, 1884.—T. H. Moorhead.

529. Nectria cucurbitula. *Fr.*

Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

530. Nectria sinopica. *Fr.*

Rosstrevor Wood, Co. Down, 1883; Ardmore Glebe, Co. Armagh, 1883. —H. W. L.

531. Nectria aquifolia. *Berk.*

Tollymore Park, Co. Down, 1885.—G. Pim, and H. W. L.

532. Xylaria corniformis. *Mont.*

Crawfordsburn, 1884; Tollymore Park, 1885; County Down.—H. W. L.

533. Xylaria hypoxylon. *Grev.*

Near Belfast, Templeton, Ann. Nat. Hist. Vol. V. Waringstown, Rosstrevor Wood, Maralin, Narrow Water Demesne, Rademon, Tollymore Park, Co. Down; Killymoon, Co. Tyrone, 1884. Very common everywhere.—H. W. L.

534. Xylaria carpophila. *Fr.*

Near Belfast, Templeton (*Sphæria carpophila.* P.), Ann. Nat. Hist., Vol. V.

535. Ustulina vulgaris. *Tul.*

Falls, Belfast, on a dead *Willow*, 1842.—W. Thompson. Ram's Island, Lough Neagh, Co. Antrim; Raughlan, County Armagh; 1884.—H. W. L.

536. Hypoxylon coccineum. *Bull.*

Florence Court, Co. Fermanagh, 1840.—W. Thompson. Donard Demesne, and Tollymore Park, Co. Down, 1885.—G. Pim and H. W. L.

537. Hypoxylon cohærens. *Fr.*

Tollymore Park, County Down, 1885.—G. Pim, and H. W. L.

538. Hypoxylon fuscum. *Fr.*

Near Belfast, Templeton (*Sphæria fusca.* P.), Ann. Nat. Hist., Vol. V. Collin Glen, County Antrim, 1844.—W. Thompson. Ardmore Glebe, and Raughlan, Co. Armagh, 1885.—H. W. L.

539. Hypoxylon rubiginosum. *Fr.*

Tollymore Park, County Down, 1885.—G. Pim, and H. W. L.

540. Hypoxylon atropurpureum. *Fr.*

Bangor, Co. Down, 1885.—W. Thompson.

541. Hypoxylon serpens. *Fr.*

Near Belfast, Templeton (*Sphæria serpens.* P.), Ann. Nat. Hist., Vol. V.

542. Eutypa lata. *Tul.*

Ardmore Glebe, Co. Armagh, 1885.—H. W. L.

543. Eutypa flavo-virens. *Tul.*

Near Belfast, Templeton (*Sphæria flavovirens.* Hoffm.) Ann. Nat. Hist., Vol. V.

544. Dothidea ulmi. *Fr.*

Ardmore, Co. Armagh, on fading leaves of *Elm.* Very common, 1883.—H. W. L.

545. Dothidea filicina. *Fr.*

Raughlan, Co. Armagh, 1883.—H. W. L.

546. Diatrype quercina. *Tul.*

Ardmore, Co. Armagh, 1883; Killymoon, Co. Tyrone, 1884.—H. W. L.

547. Diatrype verruceæformis. *Fr.*

Ranghlan, and Ardmore, Co. Armagh; Killymoon, Co. Tyrone, 1884.—H. W. L.

548. Diatrype stigma. *Fr.*

Near Belfast, Templeton (*Sphæria stigma.* Hoffm.), Ann. Nat. Hist., Vol. V.

549. Diatrype disciformis. *Fr.*

Near Belfast, Templeton (*Sphæria disciformis.* Hoffm.), Ann. Nat. Hist., Vol. V. Errigle, Co. Cavan, 1884.—T. H. Moorhead. Ardmore, Co. Armagh, 1884. Drumcro, near Maralin, and Tollymore Park, Co. Down, 1885.—H. W. L.

550. Diatrype bullata. *Fr.*

Drumcro, near Maralin, County Down, 1883.—C. H. Waddell. Killymoon, County Tyrone, 1884.—H. W. L.

551. Diatrype strumella. *Fr.*

Ardmore Glebe garden, Co. Armagh, 1884.—H. W. L.

552. Diatrype nucleata. *Carr.*

Ardmore Glebe garden, Co. Armagh, 1884.—H. W. L.

553. Diatrype ferruginea. *Fr.*

Ardmore Glebe, Co. Armagh, 1883.—H. W. L.

554. Melanconis lanciformis. *Tul.*

Near Belfast, Templeton (*Sphæria lanciformis.* Fr.), Ann. Nat. Hist., Vol. V.

555. Valsa stellulata. *Fr.*

Ardmore Glebe, Co. Armagh, 1885.—H. W. L.

556. Valsa leucostoma. *Fr.*

Ardmore Glebe, County Armagh, 1885, on dead twigs of *Cotoneaster.*—H. W. L.

557. Valsa salicina. *Fr.*

In a garden, at 2, Collin View Terrace, Lisburn Road, Belfast, on dead twigs of *Willow*, 1884.—H. W. L.

558. Valsa leiphemia. *Fr.*

Rosstrevor Wood, Co. Down, 1883.—H. W. L.

559. Cucurbitaria laburni. *De Not.*

Silverwood, near Lurgan, Co. Armagh; several large *Laburnums* dead, and one mass of this fungus, which attacks only old trees; 1885.—H. W. L.

560. Cucurbitaria elongata. *Grev.*

Desertcreat, Co. Tyrone, 1884, on dead *Laburnum.*—H. W. L.

561. Gibbera vaccinii. *Fr.*

Near Belfast, Templeton (*Sphæria vaccinii.* Sow.), Ann. Nat. Hist., Vol. V.

562. Massaria pupula. *Tul.*

Ardmore, Co. Armagh, on a wooden gate post, December, 1883.—H. W. L.

563. Sphæria aquila. *Fr.*

Near Belfast, Templeton (*Sphæria byssiseda.* Tode), Ann. Nat. Hist., Vol. V.

564. Sphæria phæostroma. *Mont.*

Ardmore, Co. Armagh, 1884.—H. W. L.

565. Sphæria spermioides. *Hoffm.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

566. Sphæria moriformis. *Tode.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

567. Sphæria mammæformis. *P.*

Ardmore, Co. Armagh, 1884, on rotten *Ivy* sticks.—H. W. L.

568. Sphæria pulvis-pyrius. *P.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

569. Sphæria scirpicola. *D. C.*

On dead *Scirpus lacustris*, floating in Lough Neagh, at Raughlan, Co. Armagh, November, 1888.—H. W. L.

570. Sphæria ocellata *B. and Br.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

571. Sphæria herbarum. *P.*

Near Belfast, Templeton (*Cladosporium herbarum.* Lk.), Ann. Nat. Hist., Vol. V. Ardmore, Co. Armagh, 1884.—H. W. L.

572. Sphæria acuta. *Moug.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

573. Sphæria pinodes. *B. and Blox.*

Ardmore Glebe, Co. Armagh, 1884.—H. W. L.

574. Sphæria gnomon. *Tode.*

Near Belfast, Templeton, Ann. Nat. Hist., Vol. V.

575. Sphærella maculæformis. *Cooke.*

Ardmore, Co. Armagh, 1884.—H. W. L.

576. Sphærella punctiformis. *P.*

Near Belfast, Templeton (*Sphæria punctiformis*), Ann. Nat. Hist., Vol. V.

577. Sphærella latebrosa. *Cooke.*

Ardmore, County Armagh, 1884, on withered *Sycamore* leaf.—H. W. L.

578. Sphærella osruthii. *Fr.*

Errigle, Co. Cavan, 1884.—T. H. Moorhead.

579. Stigmatea geranii. *Fr.*

Near Belfast, Templeton (*Dothidea geranii.* Fr.), Ann. Nat. Hist., Vol. V.

580. Dichæna strobilina. *Fr.*

Raughlan, Co. Armagh, 1884.—H. W. L.

581. Capnodium citri.

Waringstown, Co. Down, on *Camellia* leaves in a greenhouse, 1883.—H. W. L.

(*Proceedings Belfast Naturalists' Field Club.—Appendix* 1885-1886.)

FORAMINIFERA OF THE BELFAST NATURALISTS' FIELD CLUB'S CRUISE OFF BELFAST LOUGH, IN THE STEAM-TUG "PROTECTOR," JUNE, 1885;

ALSO, FORAMINIFERA FOUND BY DR. MALCOMSON, AT ROCKPORT, BELFAST LOUGH.

BY JOSEPH WRIGHT, F.G.S.

IN the summer of this year (1885) the members of the Belfast Naturalists' Field Club engaged the "Protector" for a day's dredging off Belfast Lough. During the cruise a number of dredgings were taken, and materials from the following four places were carefully put aside for future examination, viz. :—

No. 1.—Two miles S. (by compass) of Maiden Lighthouses; sand and shells; 60 fathoms.

No. 2.—Five miles S.S.E. (by compass) of Maiden Lighthouses; mud, stones, and dead shells; 60 fathoms.

No. 3.—Four miles E. (by compass) of Gobbins; mud, stones, and dead shells; 60 fathoms.

No. 4.—Six miles S.S.E. (by compass) of Black Head; sand and shells; 30 fathoms.

The object of the present communication is to give a list of the Foraminifera found in these gatherings.

A few years ago this part of our coast had, on several occasions, been dredged by Mr. William Swanston, F.G.S., and myself, and a list of the Foraminifera found was given in an appendix to the Club's Report, 1875. This,

no doubt, is the reason why so few additions to the Foraminifera of our North-East Coast were obtained from the "Protector" gatherings. S. M. Malcomson, M.D., had also made a most exhaustive search for Foraminifera in shore sand and rock pools in the vicinity of Rockport, Belfast Lough. At this place he found 87 different species, two of them—viz., *Spiroplecta biformis* and *Placopsilina cenomana*—being new to Britain. At my request, Dr. Malcomson very kindly furnished me with a list of the species which he had found, and also their relative abundance. I have given the record of his discoveries in Column 5 of the table of geographical distribution.

For the sake of completeness, I have given in the last column a list of the Foraminifera recorded in my former paper (*loc. cit.*),* and at the end of the table the names of three species which had not been met with in either the "Protector" gatherings or at Rockport. The present list, therefore, comprises all the species that are now known from this part of our coast.†

In conclusion, I have to thank Mr. H. B. Brady, F.R.S., for his kind help and advice in the identification of some of the critical species. I am also much indebted to S. M. Malcomson, M.D., for the very accurate and artistic drawings which accompany this memoir.

* Recent Foraminifera of Down and Antrim, Proceedings Belfast Naturalists' Field Club, app. 1876-7.

† Of late years our increased knowledge of Foraminifera has necessitated many changes both in the names of the genera and species, and, in consequence of these alterations, a number of the species given in my paper on Foraminifera of Down and Antrim (1876-7) are now known by other names. The following is a list of the species which have been so altered, the names by which they had been recorded being given in italics. I have not, however, thought it necessary to note any changes which may have been made in the generic names, as such will be sufficiently obvious to the reader.

Cornuspira involvens, Rs.—*Cornuspira foliacea*, Phil.
Haplophragmium pseudospirale, Will.—*Lituola nautiloidea*, Lamk.
Bolivina dilatata, Rs.—*Textularia pygmæa*, d'Orb.
Lagena lineata, Will.—*Lagena caudata*, d'Orb.
Lagena aspera, Rss.—*Lagena hispida*, Rss.
Lagena hispida, Rss.—*Lagena Jeffreysii*, Brady.
Lagena lævigata, Rss.—*Lagena lucida*, Will.
Lagena lagenoides, Will.—*Lagena ornata*, Will.
Marginulina costata, Batsch.—*Dentalina obliquestriata*, Rss.
Polymorphina gibba, d'Orb., fistulose form—*Polymorphina Orbignyi*, Zbor.
Gypsina versicularis, P. and J.—*Tinoporus lævis*, P. and J.
Gypsina inhærens, Schultze.—*Tinoporus lucidus*, Brady MS.

The following names have been excluded from the present memoir, as they are not now considered good species, viz.:- Biloculina elongata, d'Orb; Spiroloculina canaliculata, d'Orb.; Triloculina Brongniartii, d'Orb.; Lagena Lyellii, Seg.; Lagena trigono-marginata, P. and J.; Lagena oblonga, Seg.; Dentalina guttifera, d'Orb.; Textularia variabilis, Will.; and Discorbina ochracea, Will. I have also thought it best to omit the following, as the specimens found were not typical, and, in consequence, their identification not as reliable as could have been wished, viz.:—Miliolina agglutinans, d'Orb.; Textularia trochus, d'Orb.; Lagena distoma, P. and J.; Lagena gracillima, Seg.; and Nodosaria raphanus, Linn.

The following notes in reference to some of the species found may be of interest:—

Miliolina insignis, *Brady.* (Pl. xxvi. fig. 4, *a*, *b*.)

Miliolina insignis, Brady, 1882, Rep. Foram. H.M.S. Challenger, p. 165, pl. 4, figs. 8-10.

This species, in contour, resembles *Miliolina trigonula*, but differs from it in the surface of the shell being marked by closely set, regular, longitudinal costæ. Only two specimens were obtained. They were from gatherings taken a few miles apart. The size is small, and the surface ornamentation consists of faint longitudinal lines. New to Britain.

Miliolina subrotunda, *Montagu, sp. var.* (Pl. xxvi. fig. 5, *a*, *b*.)

Vermiculum subrotundum, Montagu, 1803, Test. Brit., part 2, p. 521.

This variety differs from the typical *Miliolina subrotunda* in having the peripheral edge ornamented with somewhat irregular, oblique costæ. Frequent in shallow water gatherings.

Hyperammina arborescens, *Norman, sp.* (Pl. xxvi. fig. 1.)

Psammatodendron arborescens (Norman MS.), Brady, 1881, Denkschr. d. K. Akad. Wiss. Wien, vol. xliii., p. 98, No. 13.

Mr. Brady* thus refers to this species:—"This interesting form was discovered by the Rev. A. M. Norman growing on a polyzoan (*Menipea ternata*), dredged during the cruise of the "Valorous" off Holstenborg, Greenland, at the depth of 20 fathoms, and the name *Psammatodendron arborescens* was first assigned to it. The original specimen figured in Plate XXVIII. was most kindly lent to me by Mr. Norman when it was the only known example that was even approximately perfect. Quite recently, however, the species has been found in some abundance by Mr. David Robertson, off Cumbrae, on the west coast of Scotland." A few years ago I found a fragment of it in sand which had been dredged by Mr. James Wright off Portrush, County Antrim. Three other localities, given in the "Challenger" Report, complete the list of places where the species has been found. Mr. Brady, however, adds—"It is not improbable that when it is sought for it may turn out a very common species." It has been found in the four "Protector" gatherings, and was abundant in two of them.

Ammodiscus Shoneanus. *Siddall, sp.*

Trochammina Shoneana, Siddall, 1878, Proc. Chester Soc. Nat. Sci., part 2, p. 46, figs. 1, 2.

This species has been found at only a few places, and, excepting at Rockport, where a good many specimens were gathered, is very rare where it occurs. It was first found in the Dee (Siddall), afterwards at Rockport, Belfast Lough (Malcomson), Killybegs Harbour, Donegal (Wright), Dublin Bay

* Report Forams. H.M.S. Challenger, p. 262.

(Balkwill and Wright). It has also been recorded from two of the "Challenger" gatherings—viz., off Christmas Harbour, Kerguelin Island, 120 fathoms, and Station 238, in the very deepest part of the Pacific, 3950 fathoms.* It is indeed remarkable that a species which, in this climate, has been only met with in shallow water and shore gatherings should, in the North Pacific, occur at such a great depth.

Placopsilina cenomana, *D'Orbigny.* (Pl. xxvi. fig. 3, *a*, *b*.)

Placopsilina cenomana, d'Orbigny, 1850, Prodr. Paleont., Vol. II., p. 185, No. 758.

One large specimen of this rare species was found by Dr. Malcomson at Rockport, between tides. The specimen figured is the only example which has been obtained in Britain.

Verneuilina polystropha, *Reuss, sp.* (Dimorphous form. Pl. xxvi. fig. 2.)

Bulimina polystropha, Reuss, 1845, Verstein. Böhm. Kreid., part 2, p. 109, pl. 22, fig. 53.

This species is of frequent occurrence around our coast. An abnormal form, in which the later chambers are arranged in a linear series, with a simple round aperture, is occasionally met with in shallow water gatherings. Mr. Brady considers it a dimorphous form of *Verneuilina polystropha*.

Spiroplecta biformis, *Parker and Jones, sp.*

Textularia agglutinans var. biformis, Parker and Jones, 1864, Phil. Trans., Vol. clv., p. 370, pl. 15, figs. 23, 24.

A few years ago this species was found for the first time in British water by Dr. Malcomson, who obtained several good typical specimens at Rockport.† A few specimens have since been found in Dublin Bay (Balkwill and Wright).

Lagena semilineata, *Nov. sp.* (Pl. xxvi. fig. 7.)

Test flask-shaped, with a long, ectosolenian neck, the lower extremity furnished with a short projecting neck; upper portion of the body of the shell usually smooth; lower portion ornamented with very numerous, closely-set, longitudinal sulci; neck marked with longitudinal lines, which occasionally extend a little way down the shell.

This very elegant form may be readily distinguished from *L. semistriata* by the ornament on the lower portion being closely-set, longitudinal sulci, instead of the strong costate ribs of the latter species. It has been found at only a few localities, and is rare where it occurs.

Lagena bicarinata, *Terquem, sp.* (Pl. xxvi. fig. 8, *a*, *b*.)

Fissurina bicarinata, Terquem, 1882, Mém. Soc. Géol. France, Ser. 3, Vol. ii., Mem. iii., p. 31, pl. 1, fig. 24, *a*, *b*.

Professor Williamson, in his Monograph, has figured, under the name of

* Report Forams. H.M.S. Challenger, p. 335.

† See woodcut, Trans. Roy. Ir. Academy (Science), Vol. xxviii., p. 333.

Lagena quadrata (pl. 1, figs. 27, 28), two distinct species. Fig. 27 is an oblong form of *L. lævigata*, and this variety is known by Williamson's name; fig. 28 is *L. bicarinata*. Both species are often met with around our coast.

Lagena marginata var. inæquilateralis, *Nov.* (Pl. xxvi. fig. 10, *a*, b, *c*)

This curious variety of *L. marginata* has one side strongly convex, the other side being flattened, or slightly concave; aperture at the flattened side. Rare. Common in a fossil state in the Estuarine Clay, Limavady Junction.

Spirillina margaritifera, *Williamson.* (Pl. xxvi., fig. 12, *a—b.*)

Spirillina margaritifera, Williamson, 1858, Rec. For. Gr. Br. p. 9, pl. vii. figs. 2—4.

The following is Professor Williamson's description of this species, the type in brackets being additions of mine:—"Shell consisting of numerous narrow, somewhat convex, (?) convolutions—the outer one smooth, the inner one obscured by numerous projecting tubercles, arranged in one or two series; In some parts these are most conspicuous along the centre of the convolution; in others along the spiral septal line" [peripheral edge square]. "Texture hyaline, diam., $\frac{1}{60}$."

Williamson (*loc. cit.*) describes the convolutions of this species as convex. A somewhat similar form, differing only in the convolutions being square, has been found at several localities around our coast, and so closely does his description and illustration agree with these specimens, that I have no hesitation in considering them the same. The specimens recorded as *Spirillina tuberculata*, both by Siddall, in "Memoir on the Foraminifera of the Estuary of the Dee," and by Balkwill and myself, in "Foraminifera of Dublin Bay and Irish Sea," should, I feel satisfied, be referred to *S. margaritifera*, and *S. tuberculata* should be no longer included among the British species. *S. margaritifera* differs from *S. tuberculata* in the outer convolutions being smooth, the peripheral edge square, and the tubercules being stronger, and not so numerous.

TABLE SHOWING THE DISTRIBUTION OF FORAMINIFERA OFF BELFAST LOUGH.

ABBREVIATIONS:—v r, very rare; r, rare; c, common; v c, very common; *, previously recorded.

LIST OF SPECIES.	2 miles S. of Maiden L.H., 60 fms.	5 miles S.S.E. of Maiden L.H., 60 fms.	4 miles E. of Gobbins, 60 fms.	6 miles S.S.E. of Black Head, 30 fms.	Rockport,—Between tides.	Recent Foraminifera of Down and Antrim, 1877.
Biloculina ringens (*Lamk.*)	r	c	c	f	r	*
depressa, *d'Orb.*	f	c	c	c	r	*
Spiroloculina limbata, *d'Orb.*	f	f	f	f	...	*
planulata (*Lamk.*)	...	...	...	...	f	*
Miliolina trigonula (*Lamk.*)	r	f	f	f	r	*
insignis, *Brady*	...	vr	vr	...	...	...
tricarinata, *d'Orb.*	...	r	r	..	r	*
oblonga (*Montagu*)	...	r	r	vr	vc	*
seminulum (*Linn.*)	r	f	f	f	vc	*
tenuis (*Czjzek*)	vr	r	r	...	...	...
subrotunda (*Montagu*)	c	vc	vc	vc	vc	*
var.	vr	...	...	...	...	...
secans (*d'Orb.*)	...	...	...	vr	vc	*
bicornis (*W. & J.*)	f	c	c	f	c	*
Ferussacii (*d'Orb.*)	r	r	r	r	f	*
var. near M. sclerotica, *Karrer* ...	...	...	...	...	vc	...
pulchella (*d'Orb.*)	...	...	...	...	...	*
fusca (*Brady*)	...	...	...	...	c	*
Ophthalmidium carinatum, *Balkwill & Wright*	c	c	c	r	...	...
Cornuspira involvens (*Rss.*)	r	f	f	r	c	*
Hyperammina arborescens (*Norman*) ...	r	vc	vc	r	...	...
Reophax fusiformis (*Will.*)	...	...	...	...	...	*
sp., ...	c	r	r	r	...	...
Haplophragmium glomeratum (*Brady*) ...	...	...	vr	vr	...	...
globigeriniforme (*P. & J.*)	c	c	c	c	...	*
pseudospirale (*Will.*)	...	...	...	...	...	*
canariense (*d'Orb.*)	c	c	c	c	vc	*

TABLE—*Continued.*

LIST OF SPECIES.	2 miles S. of Maiden L.H., 60 fms.	5 miles S.S.E. of Maiden L.H., 60 fms.	4 miles E. of Gobbins, 60 fms.	6 miles S.S.E. of Black Head, 30 fms.	Rockport,—Between tides.	Recent Foraminifera of Down and Antrim, 1877.
Ammodiscus incertus (*d'Orb.*)	...	vr	vr	...	...	*
gordialis (*J. & P.*)	c	c	c	r	...	*
charoides (*J. & P.*)	vr	vr	vr	...	...	...
Shoneanus, *Siddall*	...	...	...	...	r	...
Placopsilina cenomana, *d'Orb.*	...	...	...	...	vr	...
Trochammina squamata, *J. & P.* ...	f	f	f	c	...	*
inflata (*Montagu*)	...	...	...	...	c	*
macrescens, *Brady*	...	...	...	...	r	*
Textularia sagittula, *Defrance*	r	r	r	f	...	*
gramen, *d'Orb.*	c	c	c	c	r	...
agglutinans, *d'Orb.*	vr	vr	vr	...	...	*
Valvulina fusca (*Will.*)	...	vr	...	...	...	...
Verneuilina polystropha (*Rss.*)	...	r	r	...	vc	*
dimorphous form	...	...	...	...	r	...
Spiroplecta biformis (*P. & J.*)	...	...	...	...	vr	...
Gaudryina filiformis, *Berthelin*	...	...	...	...	c	...
Bulimina pupoides, *d'Orb.*	r	r	r	r	vc	*
marginata, *d'Orb.*	vr	r	r	r	vc	*
ovata, *d'Orb.*	r	f	f	vr	c	*
elegantissima, *d'Orb.*	r	r	r	vr	c	*
subteres, *Brady*	...	vr	...	...	...	...
Virgulina Schreibersiana, *Czjzek* ...	..	vr	...	...	c	*
Bolivina textilarioides, *Rss.*	r	r	r	...	...	...
punctata, *d'Orb.*	r	r	r	r	c	*
plicata, *d'Orb.*	r	r	r	r	vc	*
dilatata, *Rss.*	r	r	r	...	c	*
difformis (*Will.*)	c	c	c	c	c	*
Cassidulina lævigata, *d'Orb.*	r	c	c	f	r	*
crassa, *d'Orb.*	c	f	f	...	c	*
Lagena globosa (*Montagu*)	r	r	r	r	r	*
apiculata, *Rss.*	...	...	vr	...	...	...
lineata (*Will.*)	r	f	f	f	c	*
lævis (*Montagu*)	r	f	f	r	vc	*
aspera, *Rss.*	...	...	...	...	vr	*
hispida, *Rss.*	...	...	f	...	...	*
striata (*d'Orb.*)	...	r	r	r	vc	*

TABLE—*Continued.*

LIST OF SPECIES.	2 miles S. of Maiden L.H., 60 fms.	5 miles S.S.E. of Maiden L.H., 60 fms.	4 miles E. of Gobbins, 60 fms.	6 miles S.S.E. of Black Head, 30 fms.	Rockport,—Between tides.	Recent Foraminifera of Down and Antrim, 1877.
Lagena gracilis, *Will.*	...	..	...	...	c	...
sulcata (*W. & J.*)	f	c	c	c	vc	•
costata (*Will.*)	f	vc	vc	c	r	•
Williamsoni (*Alcock*)	c	c	c	c	vc	•
semistriata, *Will.*	r	r	r	r	f	•
striato-punctata, *P. & J.*	...	...	...	...	...	•
squamosa (*Montagu*)	f	vc	vc	c	f	•
melo (*d'Orb.*)	...	r	vr	...	r	...
hexagono (*Will.*)	r	c	c	f	f	•
lævigata (*Rss.*)	r	r	r	r	c	•
var. quadrata (*Will.*)	r	vr	vr	...	...	...
marginata (*W. & J.*)	r	r	r	r	...	•
var. inæquilateralis, nov.	vr	vr	...	...	...	...
lagenoides (*Will.*)	r	r	r	...	...	•
Orbignyana (*Seg.*)	c	c	c	c	vc	...
bicarinata (*Terquem*)	...	r	r	..	...	...
pulchella, *Brady*	...	vr	...	...	vr	•
Nodosaria scalaris (*Batsch*)	...	r	r	...	r	•
pyrula, *d Orb.*	vr	r	r	vr	r	•
(D.) communis (*d'Orb.*)	vr	vr	vr	vr	...	•
(D.) obliqua (*Linn.*)	...	r	...	...	vr	•
Lingulina carinata, *d'Orb.*	vr	...	..	...	...	...
Vaginulina legumen (*Linn.*)	...	...	...	...	r	•
linearis (*Montagu*)	...	r	r	r	...	•
Cristellaria rotulata, *Lamk.*	vr	vr	...	r	vc	•
cultrata (*Montfort*)	...	...	...	...	vr	...
crepidula (*F. & M.*)	r	r	r	r	r	•
Polymorphina lactea (*W. & J.*)	r	r	r	f	f	•
var. oblonga, *Will.*	r	r	r	r	...	•
gibba (*d'Orb.*)	f	r	r	r	f	•
fistulose form	...	r	r	...	...	•
lanceolata, *Rss.*	...	...	...	r	...	...
compressa, *d'Orb.*	...	r	r	...	c	•
rotundata (*Bornemann*)	vc	vc	vc	c	...	...
concava, *Will.*	...	...	...	...	...	•
myristiformis, *Will.*	...	...	...	vr	vr	•

TABLE—*Continued.*

LIST OF SPECIES.	2 miles S. of Maiden L.H., 60 fms.	5 miles S.S.E. of Maiden L.H., 60 fms.	4 miles E. of Gobbins, 60 fms.	6 miles S.S.E. of Black Head, 80 fms.	Rockport,—Between tides.	Recent Foraminifera of Down and Antrim, 1877.
Uvigerina angulosa, *Will.*	vr	r	r	r	c	*
Globigerina bulloides, *d'Orb.*	c	c	c	c	vc	*
inflata, *d'Orb.*	...	f	f	f	f	...
Orbulina universa, *d'Orb.*	r	r	r	...	...	*
Spirillina vivipara, *Ehrenb.*	c	r	r	f	vr	*
Patellina corrugata, *Will.*	f	f	f	f	r	*
Discorbina rosacea (*d'Orb.*)	vr	...	...	vr	vc	*
globularis (*d'Orb.*)	vc	vc	vc	vc	vc	*
orbicularis (*Terquem*)	...	...	...	...	f	...
Bertheloti (*d'Orb.*)	r	r	...	r	vr	...
Wrightii, *Brady*	vr	...	...	r	...	...
Parisiensis, *d'Orb.*	...	...	...	...	vr	*
Planorbulina Mediterranensis, *d'Orb.* ...	r	f	f	f	r	*
Truncatulina lobatula (*W. & J.*)	vc	vc	vc	vc	vc	*
refulgens (*Montfort*)	..	vr	vr	...	...	*
Ungeriana (*d'Orb.*)	...	...	...	...	f	...
Pulvinulina auricula (*F. & M.*)	vr	r	r	vr	r	*
Karsteni (*Rss.*)	...	vr	vr	...	...	...
repanda (*F. & M.*)	vr	vr	vr	...	...	*
Patagonica (*d'Orb.*)	vr	vr	vr	vr	vr	...
Rotalia Beccarii (*Linn.*)	r	f	f	c	vc	*
nitida, *Will.*	f	f	f	f	vc	*
Gypsina vesicularis (*P. & J.*)	..	...	...	vr	vr	*
inhærens (*Schultze*)	...	vr	vr	r	c	*
Nonionina turgida (*Will.*)	...	...	...	...	vr	*
scapha (*F. & M.*)	...	f	f	...	...	*
umbilicatula (*Montagu*)	...	vr	...	...	...	*
pauperata, *Balkwill & Wright*	f	vr	vr	r	f	...
depressula (*W. & J.*)	f	f	f	c	vc	*
stelligera, *d'Orb.*	...	r	r	vr	vr	...
Polystomella crispa (*Linn.*)	...	r	r	r	c	*
striato-punctata (*F. & M.*)	f	c	c	vc	vc	*
Operculina ammonoides (*Gronov.*)	...	...	...	...	...	*

Jaculella acuta, *Brady*, off Maiden L.H., 60-72 fms.
Lagena semilineata, *Nov.*, Newcastle, between tides, &c.
Spirillina margaritifera, *Will.*, Portrush, between tides.

EXPLANATION OF PLATE XXVI.

FIG 1. *Hyperammina arborescens* (Norman). x 30 diam.

,, 2. *Verneuilina polystropha* (Rs.). dimorphous form, x 75 diam.

,, 3. *Placopsilina cenomana*, d'Orb. *a*, inferior aspect; *b*, superior aspect, x 40 diam.

,, 4. *Miliolina insignis*, Brady. *a*, lateral aspect; *b*, oral aspect, x 75 diam.

,, 5. *Miliolina subrotunda* (Montagu), var. *a*, lateral aspect; *b*, oral aspect. x 50 diam.

,, 6. *Lagena semistriata*, Will. x 75 diam.

,, 7. *Lagena semilineata*, Nov. x 75 diam.

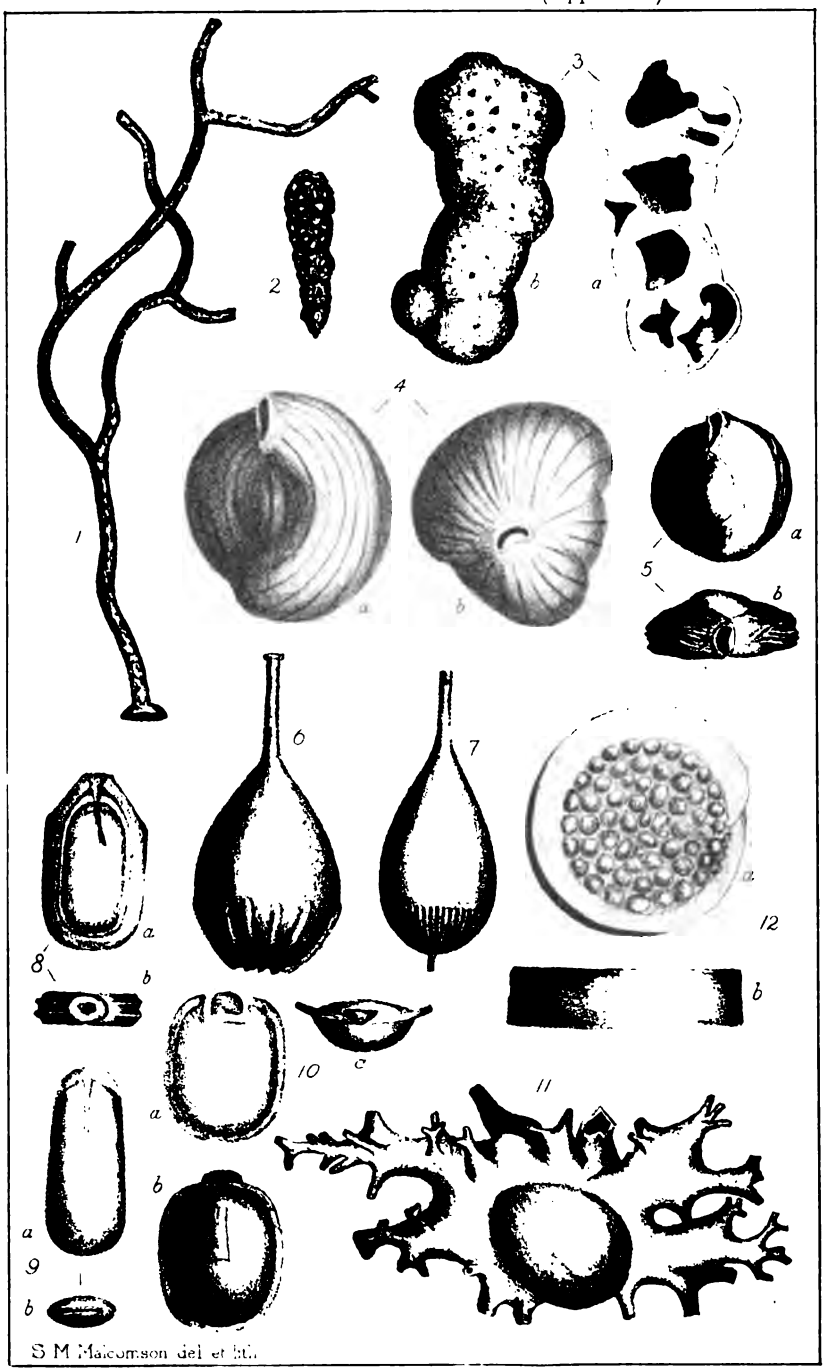
,, 8. *Lagena bicarinata* (Terquem). *a*, lateral aspect; *b*, oral aspect, x 100 diam.

,, 9. *Lagena lævigata* (Rs.), var. *quadrata*, Will. *a*, lateral aspect; *b*, oral aspect, x 100 diam.

,, 10. *Lagena marginata* (W. & J.), var. *inæquilateralis*, Nov. *a*, *b*, lateral aspects; *c*, oral aspect, x 100 diam.

,, 11. *Polymorphina gibba*, d'Orb., fistulose form, x 20 diam.

,, 12. *Spirillina margaritifera*, Will. *a*, lateral aspect; *b*, peripheral aspect, x 75 diam.



WRIGHT - FORAMINIFERA OF BELFAST LOUGH

A LIST OF THE CRETACEOUS FORAMINIFERA OF KEADY HILL, COUNTY DERRY.

BY JOSEPH WRIGHT, F.G.S.

IN the year 1874 I published a List of the Cretaceous Microzoa of Ireland. It was the result of three years' exploration in the chalk of the Counties of Antrim, Derry, and Down, the only counties in Ireland where rocks of this age occur. The Greensand in Ireland appears to be almost devoid of Microzoa. Only two Foraminifers have as yet been found in it—viz., *Orbitolina concava*,* and *Cristellaria rotulata*.† I have on one or two occasions examined greensand rocks under the microscope, but failed to find any trace of these organisms in them. With the above two exceptions, all the Microzoa found in the Irish Cretaceous rocks have been obtained from a mealy powder, known as chalk powder, which is of frequent occurrence in cavities in the flints. I do not remember to have ever visited a chalk exposure with flints that did not yield, on searching, at least some of this powder. At some places it was very scarce, at others it was abundant. It may have been merely accidental, but flints found in the vicinity of the sea usually contain a much greater quantity of the powder than those found farther inland.

The chalk in Ireland is a hard, compact limestone, known as white "limestone," of the same age as the soft white chalk of the South of England, but very different in character, the hardness of the Irish stone being presumably due to the heat and pressure of the overlying basalt. The flints found in it are

* Tate, Cretaceous Rocks of Ireland, Quart. Journ., Geol. Soc., 1865.

† Wright, Cretaceous Microzoa of Ireland, Rep. and Proc., Belfast Nat. Field Club, 1874, app. p. 73.

of two kinds—(1) Ordinary flints in amorphous masses, and usually lying in bands parallel with the bedding of the chalk, and having the longer axis in the plane of the bedding; (2) Paramoudras (in England known as potstones), usually of an irregular fusiform contour, variable in shape, and having a core of white limestone passing through them from end to end; they always occur in an upright position, or at right angles to the plane of the bedding, being the reverse of the position in which the other flints are found.

Most of the ordinary flints are of a homogenous, silicious structure throughout, others have incorporated with them a white limestone, and some a mealy powder. This material in flints freshly quarried is invariably hard, and in appearance similar to the white limestone in which the flints are imbedded. This soft powdery chalk seems to have been part of the ooze of the Cretaceous sea bottom, which got mixed up or entangled in flints in which silicification had been only partially completed. Thus enclosed in the flinty matrix, it was, no doubt, to a large degree protected from the influences which converted the soft chalk into a hard limestone. On exposure it becomes gradually changed into a powdery substance, and in this state the lovely Microzoa, so abundant in chalk, can be readily separated by washing.

The white chalk, as developed in Ireland, has for its base a somewhat pebbly and friable limestone, the joints and partings of which are coloured green by a superficial (glauconite ?) deposit. This bed was formerly well seen at Kilcorig, near Lisburn, and Professor Tate, who studied it at that time, has given a good account of it, especially with reference to fossils.* This glauconitic band occurs, as above stated, at Kilcorig, on the southern boundary of the Irish Cretaceous series; and on the north-west it has been found near Moneymore, and high up on the steep face of Benbradagh Mountain. The same line of escarpment is continued across Keady Hill, some nine miles to the north of Benbradagh, and in the limestone quarries at Keady there is a fine exposure of this basement bed of the white chalk. The palæontology of this portion of the chalk is most interesting. Its fossil fauna is much more varied than in any of the beds lying above, and it is much richer in the abundance of specimens which it yields.

When preparing my former paper on the Cretaceous Microzoa of the North of Ireland, I was greatly helped in the work by my friend, Mr. William Gray, M.R.I.A., who kindly procured for me chalk powder from numerous localities throughout the North of Ireland, one of them being Keady Hill. Although the quantity which I received was small, it nevertheless yielded a great variety of Foraminifera, a result to be expected, bearing in mind the great number of Mollusca and Echinoderms that have been collected from this locality; and I was sorry that I had not more material to examine. Some years later I visited the quarries, in company with two members of the Belfast Naturalists' Field Club, and collected several pounds weight of the material, which occurs there in

* Quart. Jour. Geol. Soc., 1865.

quantity. The following is a List of the Foraminifera found. Twenty-seven of the species are additions to the Cretaceous Fauna of Ireland, three of which are new to Science.

To my friend, Professor T. Rupert Jones, F.R.S., I am deeply indebted for kind assistance in helping me in the identification of some of the critical species, and also to my friend, S. M. Malcomson, M.D., for the very accurate and artistic figures which accompany this paper.

Species marked * are new to the Cretaceous Fauna of Ireland.

FORAMINIFERA (RETICULARIA).

LITUOLIDÆ.

Haplostiche clavulina, *Rss.* Rare.

***Thurammina** papillata, *Brady*. Pl. xxvii. fig. 12. Rare.

Ammodiscus incertus (*d'Orb.*). Rare.

Haplophragmium inflatum, *Rss.* Very rare.

TEXTULARIDÆ.

Textularia gibbosa, *d'Orb.* Rare.

pupa, *Rss.* Rare.

sagittula, *Defrance.* Common

eximia, *d'Eichwald.* Frequent.

turris, *d'Orb.* Rare.

globulosa, *Ehr.* Rare.

*conulus, *Reuss.* Bohm. Kreid., pl. xiii. fig. 75; near *Text. globulosa*, but more compact. Frequent.

Verneuilina triquetra (*Münster*). Rather rare.

*spinulosa, *Rss.* Frequent.

Tritaxia triquetra (*Münster*). Rather rare.

Spiroplecta prælonga (*Rss.*). Pl. xxvii. fig. 3. Rare.

Gaudryina rugosa, *d'Orb.* Frequent.

*Jonesiana, *sp. Nov.* Pl. xxvii. figs. 1, 2. Test elongate, tapering, somewhat compressed, quadrilateral; tri-serial portion, edges carinate and faces flat or slightly concave; biserial portion quadrilateral, the four angles more or less carinate, lateral faces concave, peripheral edge square, occasionally keeled from the carinate edge of the triserial portion extending up the shell; in the specimen figured the keel is not connected with the triserial part. I have pleasure in naming this species after my friend, Professor T. Rupert Jones, F.R.S. Rare.

***Clavulina** angularis, *d Orb.* One specimen.

Bulimina Presli, *Rss.* Frequent.

affinis, *d'Orb.* Frequent.
brevis, *d'Orb.* Frequent.
intermedia, *Rss.* Rare.
*Buchiana, *d'Orb.* Rare.

Virgulina tegulata, *Rss.* Var. Common.

***Bolivina** obsoleta (*Eley.*). Rather rare.

decorata, *Jones MS.* Pl. xxvii. figs. 7, 8. Test elongate, compressed broad at the oral end, and tapering to a rounded point at the aboral extremity; surface ornamented with prominent oblong tubercles which are arranged in oblique rows. Common.

Pleurostomella fusiformis, *Rss.* Rare.

LAGENIDÆ.

***Lagena** globosa (*Montf.*). Rather rare.

apiculata, *Rss.* Rare.
sulcata (*W. and J.*). Rather rare.
*gracilis, *Will.* One specimen.

***Nodosaria** (Glandulina) lævigata, *d'Orb.* Very rare.

*(Glandulina) obliquilimbata, *sp. Nov., Jones MS.* Pl. xxvii. fig 5. Test elongate, with oblique limbate sutures. One specimen.
glabra, *d'Orb.*, and dentaline variety. Rather rare.
radicula (*Linn.*). Rather rare.
.. var., near *N. conferta.* Very rare.
hispida, *d'Orb.* Rare.
(D.) farcimen (*Sold.*), var. Lorneiana, *d'Orb.* Rare.
.. exquisitely delicate variety. Rare.
(D.) consobrina, *d'Orb*, var. irregularis, *d'Orb.* Rare.
.. var. emaciata, *Rss.* Very rare.
(D.) soluta, *Rss.* Very rare.
.. var. Lilli, *Rss.* Rare.
(D.) nodosa, *d'Orb.*, var. Rare.
(D.) pauperata, *d'Orb.* Common.
(D.) communis, *d'Orb.* Frequent.
acicula, *Lamk.* Rather rare.
Zippei, *Rss.*, var. alternata, *var. Nov. Jones MS.* Pl. xxvii. fig. 10. This variety has ribs of normal character, alternating with lines of interrupted costæ. Very rare.
raphanus (*Linn.*). Rather rare.
.. var. inflata, *Rss.* Frequent.
.. short, coarse variety. Common.

Frondicularia striatula, *Rss.* Frequent.
angustata, *Nilsson.* Rare.
Archiaciana, *d'Orb.* Rare.
elliptica (*Nilsson*). Very rare.
mucronata, *Rss.*, var. Rather rare.

***Rhabdogonium** excavatum, *Rss.* One specimen.

Marginulina costata (*Batsch*). Rare.
*Reussiana, *sp. Nov. Jones MS.* Pl. xxvii. fig. 6. A very fine smooth *Marginulina*, with the later segments elongated in a linear series. Frequent.

***Vaginulina** legumen (*Linn.*). Rare.
trilobata, *d'Orb.* Frequent.
*Bronni (*Roemer*). One specimen.
costulata, *Rss.* Very rare.

Cristellaria acutauricularis (*F. and M.*). Rare.
italica, *Defrance.* Specimens very fine. Rather rare.
triangularis, *d'Orb.* Rare.
rotulata (*Lamk.*). Abundant.
*cultrata (*Montf.*). One specimen.
*crepidula (*F. and M.*). Pl. xxvii. fig. 4. One very fine specimen.
*simplex, *d'Orb.* Rare.
recta, *d'Orb.* Rare.
*cymboides, *d'Orb.* Rare.
ornata (*Rss.*). Very rare.

Flabellina pulchra, *d'Orb.* Very rare.
.. smooth variety, with parallel sides. Very rare
reticulata, *Rss.* Common.

***Polymorphina** gibba, *d'Orb.* Rare.
.. fistulose form. Rare.
fusiformis, *Roemer.* Frequent.
.. fistulose form. Rare.
*cylindrica, *Borneman.* Frequent.
regina, *B. P. and J.*, var. Pl. xxvii. fig. 14. Rare.
.. *fistulose form. Pl. xxvii. fig. 13. One specimen.

Sagrina nodosa, *P. and J.* Frequent.

Ramulina brachiata, *Jones.* Rare.
lævis, *Jones.* Rare.
*aculeata (*d'Orb.*). Pl. xxvii. fig. 11. Rare.

Globigerina bulloides, *d'Orb.* Rare.

... heaped variety. Rather rare.

cretacea, *d'Orb.* Abundant.

marginata, *Rss.* Rare.

*æquilateralis, *Br.* Pl. xxvii. fig. 9. Frequent.

***Orbulina** universa, *d'Orb.* Rare.

***Pullenia** sphæroides (*d'Orb.*). Rare.

quinqueloba, *Rss.* Rather rare.

Planorbulina exsculpta, *Rss.* Frequent.

crenulata (*Rss.*). Rather rare.

Truncatulina lobatula (*W. and J.*). Frequent.

Planorbulina ammonoides, *Rss.* Abundant.

.. var., with extra shell growth. Abundant.

Pulvinulina Micheliniana, *d'Orb.* Frequent.

Rotalia orbicularis (*d'Orb.*), var. Abundant.

*Beccarii (*Linn.*). Pl. xxvii. fig. 15. Rare.

EXPLANATION OF PLATE XXVII.

FIG. 1. *Gaudryina Jonesiana*, Nov. *a*, lateral aspect; *b*, oral aspect; x, 40 diam.

,, 2. *Gaudryina Jonesiana*, Nov. *a*, peripheral aspect; x, 40 diam.

,, 3. *Spiroplecta prælonga* (Rss.). x, 60 diam.

,, 4. *Cristellaria crepidula* (F. and M.). *a*, lateral aspect; *b*, oral aspect; x, 20 diam.

,, 5. *Nodosaria* (*Glandulina*) *obliquilimbata*, Nov., Jones MS. *a*, lateral aspect; *b*, oral aspect; x, 20 diam.

,, 6. *Marginulina Reussiana*, Nov., Jones MS. *a*, lateral aspect; *b*, oral aspect; x, 20 diam.

,, 7. *Bolivina decorata*, Jones MS. x, 60 diam.

,, 8. *Bolivina decorata*, Jones MS. *a*, lateral aspect; *b*, oral aspect; x, 60 diam.

,, 9. *Globigerina æquilateralis*, Br. *a*, lateral aspect; *b*, oral aspect; x, 60 diam.

,, 10. *Nodosaria Zippei*, Rss., *var. alternata*, Nov., Jones MS. x, 30 diam.

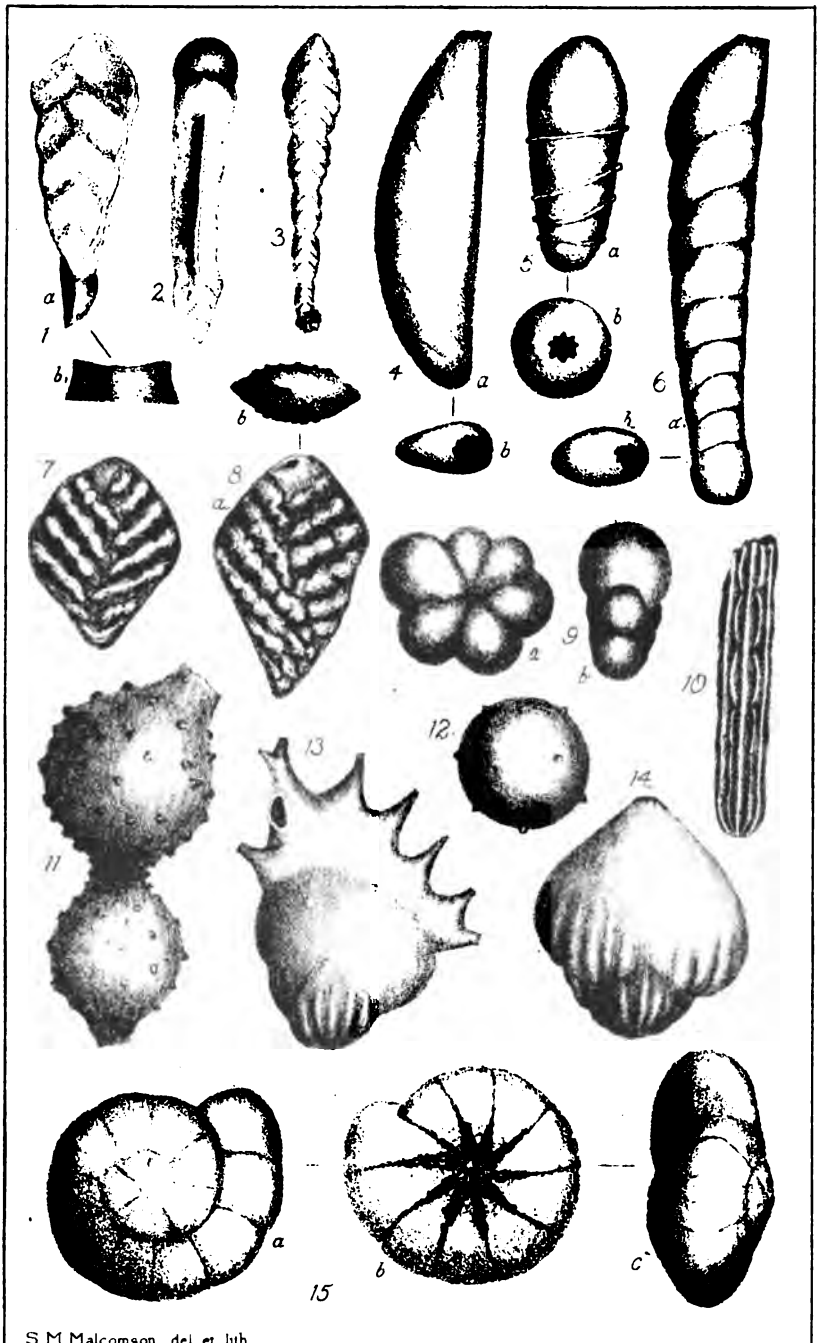
,, 11. *Ramulina aculeata* (d'Orb.). x, 30 diam.

,, 12. *Thurammina papillata*, Br. x, 60 diam.

,, 13. *Polymorphina regina*, B. P. and J., var. fistulose form. x, 40 diam.

,, 14. *Polymorphina regina*, B. P. and J., var. x, 60 diam.

,, 15. *Rotalia Beccarii* (Linn.). *a*, superior aspect; *b*, inferior aspect; *c*, oral aspect; x, 40 diam.



S. M. Malcomson, del. et lith.

WRIGHT_ CHALK FORAMINIFERA_ KEADY HILL.

(*Proceedings Belfast Naturalists' Field Club.—Appendix* 1884-85.)

ERRATUM.—The following 10 pages should bear the folios 335 to 344.

A LIST OF IRISH COLEOPTERA COLLECTED MAINLY BY THE LATE ROBERT PATTERSON, ESQ., F.R.S., IN THE YEAR 1829.

THE following list has been prepared from the manuscript catalogue of a cabinet of Coleoptera now in the possession of the family, and formerly the property of the late Mr. Patterson.

The collection referred to was made in the year 1829. Some of the specimens were received from other well known naturalists, but by far the greater number were personally collected by Mr. Patterson himself in the North of Ireland. It is fortunate for the purpose of the present compilation that this MS. catalogue was prepared with the accuracy and precision that characterised all Mr. Patterson's work. Except in a very few instances, the date and locality of every capture has been given; and where the specimen has been acquired from any other entomologist it is so stated, and also whether such are Irish or English. As we are here only concerned with Irish localities, we do not record those species to which English *habitats* alone are assigned, nor any of those whose names appear in the manuscript, but are not localised.

In connection with the series of local lists issued by the Belfast Naturalists' Field Club, it is considered that the present may be a useful contribution. It is also rendered of more value by the fact that so few lists of Irish insects have hitherto been published. Further, it may be hoped that this list will be favourably received from the fact that it records the early work of some of the pioneers of natural science in the North of Ireland, and founders of the Belfast Natural History Society. Anything connected with the names of Templeton, Drummond, Patterson, Haliday, or Hyndman will be of interest to the naturalists of the present day, and still more to those who may succeed them. A review of

the work here summarised should also act as a stimulus to our youthful members. It will be seen how much could be accomplished in a year by one quite young, and fully occupied in business matters. This, too, at a time when books of reference were much less accessible than at present.

The classification of the following catalogue is that of Stephens's Systematic List of British Insects.

Abbreviations:—A. H. H.—A. H. Haliday,* F.L.S.; G. C. H.—Geo. C. Hyndman; R. T.—Robert Templeton.

SCARITIDÆ.

Clivina fossor.
Sand pit, Cranmore; under a stone, Rostrevor Mountain.—R. T.

Dyschirius politus.
Cranmore.

CARABIDÆ.

Cychrus rostratus.
Mourne Mountains.—Mr. Drummond.

Carabus catenulatus.
Rostrevor Mountain, near the summit.—R. T.

C. cancellatus.
Lurgan; under a stone near M'Swine's Gun, Horn Head, Co. Donegal—R. T.

C. glabratus.
Slieve Donard, on the open part of the heath.

Nelobia brevicollis.
Sand pit, Cranmore; under stones, Horn Head.—R. T.

Leistus fulvibarbis.
Cranmore.

HARPALIDÆ.

Loricera pilicornis.
Shore of Lough Neagh, near Shane's Castle.

Chlænius nigricornis.
Irish—from A. H. H.

Anchomenus prasinus.
Shore of Lough Neagh, near Shane's Castle.

A. albipes.
With the preceding species.

A. oblongus.
Cranmore, among corn.

Platynus angusticollis.
In the cellar of our house.

Agonum marginatum.
Lough Neagh; under stones, near the mouth of the Sixmilewater.

A. parumpunctatum.
Shore of Lough Neagh, near Shane's Castle.

*Note—In Appendix VIII., p. 211. A. L. Haliday should be A. H. Halliday.

Odontonyx rotundatus.
Horn Head, Co. Donegal.—R. T.

Synuchus vivalis.
Under stones, Rostrevor Mountain.

Calathus melanocephalus.
With the preceding.

C. cisteiloides.
With the two last species.

Platyderes erythropus.
Cranmore; Moyntuagh Bogs.

Poecilus cupreus.
Among corn at Cranmore.

P. rufifemoratus.
Cranmore. Common.

P. versicolor.
In Mr. Brownlow's demesne at Lurgan.

Omaseus Bulwerii.
Rostrevor Mountain.

O. nigrita.
Under stones, near Ardglass.

O. melanurius.
Rostrevor Mountain. Very common.

Steropus madidus.
Very common.

Stomis pumicatus.
Lough Neagh.

Patrobus rufipes.
Horn Head.—R. T.; under stones, Rostrevor Mountain.

Platysma niger.
Tollymore Park; mountains at Rostrevor.

Abax striola.
Tollymore Park.

Amara curynota.
Under stones, near Ardglass.

A. communis.
Castlewellan; Moyntuagh Bogs.

A. familiaris.
Among corn at Cranmore.

Bradytus apricarius.
Under stones, Castlewellan; among corn, Cranmore; Moyntuagh Bogs.

Harpalus ruficornis.
Tollymore Park.

Trechus minutus (aquaticus).
Moyntuagh Bogs, under stones.

Tachys obtusus.
Cranmore, among corn.

Philocthes fuscipes ?
Among corn at Cranmore.

BEMBIDIIDÆ.

Peryphus femoratus.
Castlewellan, under stones ; shore of Lough Neagh, near Shane's Castle

P. viridi-æneus.
With the preceding.

Tachypus Andreæ.
Shore of Lough Neagh.

T. striatus.
Shore of Lough Neagh.

T. properans.
Among corn at Cranmore.

***Bembidium paludosum.**
Shore of Lough Neagh, near Shane's Castle.

ELAPHRIDÆ.

Notiophilus aquaticus.
Slieve Donard, under stones.

N. biguttatus.
Horn Head, Co. Donegal.—R. T.

Elephras cupreus.
Irish—from Mr. Haliday.

E. riparius.
Lough Neagh at Shane's Castle, among sand, gravel and short grass, near the water's edge.

Blethisa borealis.
Lough Neagh. Given to me by Mr. Haliday, who had not before seen any indigenous specimens.

DYTICIDÆ.

Haliplus ferrugineus.
Irish—from Mr. Haliday.

Hygrotus scitulus.
Moyntuagh Bogs, on roots and stems of aquatic plants.

H. pictus.
With the preceding.

Hydroporus dorsalis ?
With the two last named species.

* The first specimen of this species found in Ireland.

Noterus crassicornis.
Moyntuagh Bogs, with the preceding.

Colymbetes fuliginosus.
Common in the ponds at Cranmore.

C. bipustulatus.
In a pond in the fort-field at Moira.

Dytiscus marginalis.
Irish—from G. C. H.

D. punctulatus.
Common in the ponds at Cranmore.

Acilius sulcatus.
Moira, bog hole in the fort-field.

GYRINIDÆ.

Gyrinus natator.
Cranmore, common in the ponds.

LIMNIIDÆ.

Limnius æneus.
Irish—from G. C. H.

HELEPHORIDÆ.

Helephorus nubilus.
Cranmore, coming out of rotten wood.

HYDROPHILIDÆ.

Limnebius ater.
Irish—from A. H. H.

L. truncatellus.
Irish—from A. H. H.

SPHÆRIDIIDÆ.

Cercyon sp. ?
On roots and stems of aquatic plants in Moyntuagh Bogs.

ANISOTOMIDÆ.

Orthoperus pusillus.
Irish—from A. H. H.

SILPHIDÆ.

Necrophorous vespillo.
Found in the rabbit warren, at Holywood, in 1827, by James Emerson (Sir James Emerson Tennent).

Oiceoptoma rugosa.
Irish—from A. H. H.

O. sinuata.
Shore of Lough Neagh, near Shane's Castle.

Phosphuga subrotundata.
Cranmore. Very common.

NITIDULIDÆ.

Nitidula discoidea.
Irish—from A. H. H.

N. obsoleta.
Castlewellan.

Meligethes viridescens (?)
Cranmore, in flowers.

M. urticæ (?)
Cranmore.

ENGIDÆ.

Atomaria fuscipes.
Irish—from A. H. H.

Cryptophagus cavicis.
Irish—from A. H. H.

Byturus tomentosus.
Found at Cranmore, under the bark of a decayed beech tree, by R. T.

Latridius transversus.
Cranmore.

DERMESTIDÆ.

Throscus dermestoides.
Holywood, rare—from A. H. H.

BYRRHIDÆ.

Byrrhus sericeus.
Cranmore.

HISTERIDÆ.

Hister carbonarius.
Cranmore.

H. nitidulus.
Irish—from A. H. H.

GEOTRUPIDÆ.

Geotrupes sylvaticus.
County Donegal; road from Churchhill to Lough Neagh, R. T., and by the edge of Lough Neagh, R. T. Mourne Mountains (?) Mr. Drummond.

G. stercorarius.
Common.

APHODIIDÆ.

Aphodius terrestris.
Castlewellan.

A. rufipes.
Cranmore.

A. contaminatus.
Rostrevor Mountain.

MELOLONTHIDÆ.

Serica brunnea.
Irish—from A. H. H.

Melolontha vulgaris.
Cranmore, also an Irish specimen from G. C. H.

Anomala horticola.
Shane's Castle.

ELATERIDÆ.

Hemirhipus limbatus.
Cranmore.

H. marginatus.
Irish—from A. H. H.

H. obscurus.
Cranmore.

Elater cupreus (?)
Cranmore.

E. niger (?)
Cranmore.

CEBRIONEDÆ.

Atopa cervina.
Irish—from A. H. H.

CYPHONIDÆ.

Cyphon melanurus.
Irish—from A. H. H.

C. padi.
Cranmore, also an Irish specimen from A. H. H.

TELEPHORIDÆ.

Telephorus pallidus.
Cranmore.

PTINIDÆ.

Ptinus fur.
Irish—from A. H. H.

P. crenatus.
Irish—from A. H. H.

Cis sp. (?)
Castlewellan.

CURCULIONIDÆ.

Cossonus Tardii.
Cranmore. Found during the entire month of June by turning up the under side of an alder, which lay in the farm-yard, and from which the bark

had been stripped. Generally found in clusters of three and four, ranged side by side. They were not found in any other situation, though the adjoining trees were carefully examined by R. T.

Ceutorhynchus didymus.
Cranmore.

Medyus assimilis (?)
Cranmore.

Orchestes fagi (calcar).
Cranmore.

Anthonomus fasciatus.
Castlewellan Demesne.

Notaris acridulus.
Cranmore, among corn.

Liophlœus nubilus.
Cranmore.

Otiorhynchus sulcatus.
Cranmore.

O. notatus.
Mourne Mountains.—Mr. Drummond.

Philopedon geminatus.
Cranmore.

Strophosmus coryli.
Rostrevor Mountain, on a hazel.

Polydrusus oblongus.
Cranmore.

Phyllobius parvulus.
Cranmore.

Apion hydrolapathi.
On a rhododendron, at Cranmore.

A. flavipes.
Cranmore.

SALPINGIDÆ.

Salpingus roboris (ruficollis).
Taken under the bark of a holly in Tollymore Park.

LEPTURIDÆ.

Leptura ruficornis.
Cranmore.

CRIOCERIDÆ.

Donacia festucæ (proteus).
On rushes in the Moyntuagh Bogs.

GALERUCIDÆ.

Galeruca caprææ.
Cranmore.

Haltica exoleta.
Cranmore, among corn.

H. dentipes (concinna).
Cranmore, among corn.

CHRYSOMELIDÆ.

Chrysomela cochleariæ.
Castlewellan.

C. polygoni.
Cranmore.

C. raphani.
On Slieve Croob, about small pools of water.

C. polita.
Under stones on the beach, near Shane's Castle.

COCCINELLIDÆ.

Coccinella tredecimpunctata.
Cranmore.

BLAPSIDÆ.

Blaps mortisago.
In our shop, crawling up the wall, also in our cellar.

MORDELLIDÆ.

Anaspis ruficollis.
Cranmore.

CANTHARIDÆ.

Proscarabeus violaceus.
Near Holywood.—From A. H. H.

TACHYPORIDÆ.

Bolitobius atricapillus.
Tollymore Park, on a wall.

Tachinus marginellus.
Slieve Donard.

T. pullus.
Lough Neagh, at Ardmore, found by Miss Jellett.

STAPHYLINIDÆ.

Staphylinus erythropterus.
Among corn at Cranmore.

S. castanopterus.
Cranmore, and Squire's Hill.

Quedius tristis.
Cranmore, among corn.

Philonthus politus.
With the preceding.

P. marginatus.
With the two preceding species.

Gyrohypnus cruentatus.
Castlewellan.

STENIDÆ.

Paederus riparius.
Tollymore Park.

Oxytelus cornutus.
Cranmore, among corn.

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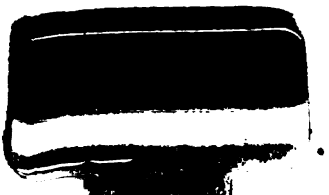

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